ANNUAL RATES OF SUBSCRIPTION.

Farmers, Graziers, Horticulturists, and Schools of Arts, **One Shilling,** members of Agricultural Societies, **Five Shillings,** including postage. General Public, **Ten Shillings,** including postage.

QUEENSLAND AGRICULTURAL JOURNAL

VOL. XLVIII. 1 AUGUST, 1937. PART 2

Event and Comment

The Sugar Situation.

IN the course of a recent address to his constituents at Mackay, the Premier, the Hon. W. Forgan Smith, LL.D., said the world, from a sugar point of view, differed from what it had been some years ago. Prior to the war Great Britain grew little sugar except experimentally. To-day, under a system of bounties, Britain was producing a fourth of her requirements. That bounty was frequently in excess of the value of the sugar produced, or 100 per cent. more on the world value of sugar at certain times. That policy was introduced in order that Britain would not have to depend entirely on other countries for the whole of her food supplies. Soviet Russia, which previously was not a big producer of sugar, would have 3,000,000 tons this year, a large proportion of which would be exported, though the people, if given an opportunity, would be well able to consume it all. In other industries excess production brought down the value of the goods actually sold, and that was the position in the sugar industry; so the recent international conference had to find a way by which production could be controlled in the free market and that market supplied only with what it was able to absorb. The agreement provided for an expanding share of the free market; thus if consumption increased there Australia would be entitled to a proportionate share of such increase.

The peak year scheme adopted by the canegrowers of Queensland in 1929 provided for 611,428 tons, that being regarded as the economic limit of production owing to the uncertainty of markets overseas. With the quota now received and a protected market for five years, he suggested that the peak could be increased by 100,000 tons, making it 711,428 tons. It would mean that this quantity would be in No. 1 pool, which included Australian consumption plus the 400,000 tons Australia was permitted to export. If more than that were produced, it could be treated as excess sugar, as at present. This did not involve any increase in the total production of sugar-cane over what had been produced last year or this year.

Queensland's Agricultural Advantages.

FUNDAMENTALLY the things which counted in successful agriculture were water, soil and climate. All these advantages Queensland possessed in a remarkable degree, said the Minister for Agriculture and Stock, the Hon. Frank W. Bulcock, in the course of an address to farmers recently.

Continuing, he remarked that many had noticed that the House of Commons had adopted a measure for the development of agriculture in Great Britain. They might think that this was of small moment to agricultural industries in Australia or to themselves, but if they analysed the motive underlying the British plan they would find that it was designed to stimulate production along more efficient lines. It was proposed under this plan to make a charge of not more than £7,000,000 per annum to topdress agricultural land and improve the various branches of British agriculture.

As the British policy aimed at efficiency in agricultural production, so they should endeavour to promote efficiency in their own primary industries. Industries were governed by many factors, not the least of which was economics. They knew as growers that the economics of the sugar industry were such as to cause them a good deal of perplexity.

Mr. Bulcock reminded the gathering that in addition to making plans to compete on an equal footing with others in the United Kingdom they should not neglect their home market. Australia imported about 500,000 tons of agricultural products, all of which could be grown in Queensland.

"Those who are prepared to face facts must realise one thing," said the Minister. "That is that the expansion of the sugar industry is going to be slow and we must necessarily extend our other production so that we might justify our right to the land we now hold. To grow crops with the greatest efficiency we must provide for the vicissitudes of the weather."

Mr. Bulcock added that irrigation entered largely into the question of providing permanent water. He had received 100 different suggestions for schemes ranging from one based on the old Chinese system of drawing water from a bucket and dropping it on the ground to one involving the use of the most modern irrigation plant. At the same time, he suggested that irrigation was one of the most intricate problems connected with agriculture. Irrigation schemes would have to be worked out by the producers, financiers, technical men, the Government and probably the local authorities.

North Queensland—A Land of Opportunity.

ON his return to Brisbane from a tour of North Queensland, His Excellency the Lieutenant-Governor, Sir James Blair, said that he regarded the North as a land of opportunity, by reason of its magnificent resources. It was a rich region offering bright prospects for young, vigorous, earnest men not afraid of hard work and with a will to succeed, if they would go out and seek to establish themselves on the land. For the land-minded the opportunities were unlimited.

It was sometimes asserted that the North was not a place for white people. He wanted to challenge that. In cities, townships, and scattered areas of settlement he had visited all the schools, and had been impressed with the splendid health, physique and mentality of the children. They lacked nothing in comparison with the children of less tropical regions. Adults and children were a testimonial to the climatic conditions and the general suitability of the North to white settlement and development.

Rural Trends.

PRIMARY producing countries, like Australia, would eventually be faced with declining markets for their products, said Dr. Edmund Brunner, Professor of Education in the Teachers' College of Columbia University, New York City, in the course of a recent public address in Brisbane. Speaking on "Rural Trends," he said one of the most important trends of the present century was the urbanward drift of population. It dated from the beginning of the modern industrial era, but had become especially pronounced in the last half-century. In Australia the strictly rural population was less than two-fifths of the total, the metropolitan almost 47 per cent.

The farm family had a unity and cohesiveness that had never been equalled by the urban. Its sharply lower divorce rates showed this. The farm family was bound by a single interest—the co-operation of man with animals and plants in the task of helping to answer the world's prayer for daily bread.

The urban world must find solutions for its problems; the rural world must adjust itself to them. Educationally at least this adjustment had been but poorly made. It was charged, and with some justice, that the rural school trained its children away from the soil and toward the city. So in America they began to teach vocational agriculture and tried to keep rural youth in rural areas.

The interests and thoughts of rural men and women had broadened. Increasingly rural people had sought to understand the forces that baffled them. Increasingly they had sought outlets for expression in drama, in community service, in recreation.

Not all the changes had been losses, and over and above trends in organisation, in social and economic life, the rural people seemed to be taking a place of new importance in a society that was becoming increasingly interdependent.

It was the task of education to watch the more important trends and be ready to see the implications they held for the service they could give to the citizens of to-morrow, in order that some day the sun might rise on a world that knew the peace, the serenity and the satisfaction that to-day was found chiefly in the countryside.

The Treatment of Tobacco Seed-Bed Covers to Prolong their Useful Life.

J. H. SIMMONDS, M.Sc., Senior Pathologist, and L. F. MANDELSON, B.Sc.Agr., Agricultural Research Officer.

FOLLOWING on the announcement by the Council for Scientific and Industrial Research[1] that blue mould of tobacco could be effectively prevented in the seed bed by subjecting the seedlings to the vapour of benzol, the Department of Agriculture and Stock initiated experiments to ascertain how this new method of control could be adapted to Queensland conditions. Amongst other things a cheaper means of enclosing the gas than the standard cold frame was sought. A satisfactory method was found to be the provision of a calico tent fitting tightly over solid triangular ends and a wooden border along each side. In earlier work the calico for these tents and for the covers of experimental cold frames was treated with linseed oil as recommended by May[5] in New South Wales and later used by Angell, Hill, and Allan[1] in their experiments on the vapour treatment of seedlings. This was assumed to be necessary for the dual purpose of making the cover more translucent and more gas-tight. It was soon found that linseed oil possessed two distinct disadvantages. The calico was rendered very brittle and easily torn, and mould growth was intensified to such an extent that insufficient light was allowed through. Moreover, linseed oil is an expensive preparation to use. It therefore appeared that one way to cheapen the initial cost of the benzol method would be to find a suitable substitute for the oil treatment, and some attention was accordingly given to this line of investigation.

Methods Employed.

Altogether fourteen different materials or combinations were tried as calico dressings. These are listed in the summary on page 113. Four different experiments were involved in testing them. In two of these the treatment of the calico was carried out in the laboratory. Portions of each of the treated pieces were then removed and wrapped up together in a piece of badly mildewed canvas and the whole left moist. This ensured a rapid development of mould on those pieces not adequately protected and allowed a quick estimate to be made of the relative value of the treatments used. A second portion was tested under conditions conforming more to seed-bed practice. The piece of calico was either hung from a horizontal wire over an old tobacco seed-bed (first series) or used as a cover for a small cold frame (second series). The other two experiments consisted of field trials at Gayndah and Miriam Vale, in which entire seed-bed covers of the tent variety were treated and compared. R. A. Tarrant and N. E. Goodchild of the Agricultural branch were responsible for the work entailed in these field experiments.

Some of the treatments were tested in all four experiments and others of less promise in only one or two. No essential variation was noted in the relative merit of the same treatment throughout the experiments. A difference did occur, however, according to the length of exposure. A tabulated summary of the observations made will be found on page 113. The relative strength of the material was judged on an entirely arbitrary standard by the simple process of noting the ease with which it could be torn by the hands. As it was first assumed

that some form of gas and waterproofing was necessary, estimates of the relative waterproofing qualities were obtained by noting the time taken for equal quantities of water to percolate through a standard depression made in the calico tied over the mouth of a jar.

Discussion of Results.

Although these experiments were not by any means extensive, several interesting facts were demonstrated. In the first place, it was found that special proofing of the calico is unnecessary, and a mildew preventive is all that is required. As evidence for this conclusion the following facts may be cited. Not more than a 5 per cent. variation from the mean occurred in the total evaporation over 28 days when equal quantities of benzol were used in frames covered with calico treated with Shirlan, alum-lead acetate-glue size, Shirlan followed by soap-alum-gelatin, linseed oil, Shirlan followed by linseed oil, Shirlan followed by linseed oil in petrol, and Shirlan followed by paraffin wax in petrol. No differences were noted in the efficiency of blue mould control in any of these frames and the growth of the seedlings was similar throughout. The rate of diffusion of benzol through calico subjected to several of these treatments was the same for all, when once they had been exposed to the weather for some time, but in calico freshly oiled it was reduced to about one-half.

SUMMARY OF DATA REGARDING CALICO TREATMENTS BASED ON THE RESULTS OF FOUR EXPERIMENTS.

Material.	Mildew development		Loss of Strength.	Water-proofing.	Interpretation of symbols.
	3 Months.	6 Months.			
					Mildew Development.
					− Nil.
Untreated calico	+++	+++	−	++++	+ Slight (no importance).
Alum. Lead acetate ..	+		+	++++	++ Moderate.
Alum. Lead acetate + glue size	+	+++	+	++	+++ Serious.
Shirlan NA. (W.S.) 1% ..	+		+	++++	++++ Very serious.
Shirlan AG. 1%	+	+++	+	++++	
Shirlan AG. Alum + soap + gelatin	+	+++	+	+	——
Copper sulphate. Soft soap	+		+	++	*Loss of Strength.*
Paraffin wax in petrol ..	++++		++	+	− Nil compared with
Shirlan A.G. Paraffin wax in petrol	++	++++	++	+	untreated.
					+ Slight (no importance).
Raw linseed oil	++++	++++	++++	+	++ Moderate.
Shirlan AG. Linseed oil ..	++++	++++	++++	+	+++ Serious.
Shirlan AG. Linseed oil in petrol (1 to 2)	++++	++++	++++	+++	++++ Very serious.
Proprietary mildew preventive	−		++	++++	——
					Waterproofing.
Proprietary waterproofing material No. 1	++		+++	+	+ Good.
Proprietary waterproofing material No. 2	++++	++++	++++	+	++ Moderate.
					+++ Slight.
					++++ Nil (similar to untreated).

One point strikingly demonstrated was that linseed oil is unsatisfactory in all combinations, since it intensifies mildew development and renders the fabric very brittle. The possible inclusion of this oil in the preparation of the two proprietary waterproofing materials used may have accounted for their poor showing. Paraffin wax dissolved in petrol, while excellent for waterproofing purposes, is also conducive to mildewing and tends to weaken the material.

A mixture containing paraffin wax, petroleum jelly, boiled linseed oil and mineral turpentine, similar in composition to proprietary waterproofing compound No. 2, has been recommended by Sharp[6] in Western Australia, but it evidently would be unsatisfactory under Queensland conditions.

The Shirlan-alum-soap-gelatin[3] combination proved a good waterproofing material without possessing the disadvantages of those containing paraffin, but the extra cost involved precludes its use for seed-bed covers where a high degree of proofing is apparently unnecessary.

One proprietary line containing copper napthenate gave good control of mildew in preliminary trials but was not further investigated on account of its high cost. The copper sulphate-soft soap application resulted in a bluish coloration of the calico, which was considered a disadvantage.

Two of the dressings were sufficiently satisfactory, when all aspects are considered, to merit their recommendation. These are the alum-lead acetate and Shirlan treatments. Although effective for several months, neither of these prevents mildew indefinitely, and, unless something better is discovered in the meantime, it may be necessary to renew the treatment each year. The alum-lead acetate method possesses the advantage of being somewhat cheaper, but is more cumbersome since it entails immersion in two separate solutions. However, further investigations may show that these can be combined into one without loss of efficiency. The details of these two methods are given below.

Alum—Lead Acetate.

The formula used for this dressing is based on one recommended by Holden[4] and was brought under notice by H. E. Young, Assistant Plant Pathologist. A modification simplifying the preparation and allowing for the addition of glue was suggested by N. E. Goodchild, but has not been fully investigated.

Two solutions are necessary, one of alum and another of commercial lead acetate (sugar of lead). The method of preparing 5 gallons of each, and the procedure entailed, is as follows:—

1. Place 1 lb. alum in 1 gallon of boiling water and stir until dissolved. Then add this solution to 4 gallons of cold water, making 5 gallons in all.

Soak the calico in the alum solution for one day, kneading it well so as to ensure thorough wetting and to remove the sizing material from the cloth.

2. Place ½ lb. lead acetate in 1 gallon of boiling water and then stir until dissolved. Add this solution to 4 gallons of cold water making a total of 5 gallons as before.

Remove the material from the alum solution when the required time has expired and wring lightly. Then soak it in the lead acetate solution for from 5 to 6 hours. Remove, wring lightly, and allow to dry.

The cost of the materials used in making up the two solutions of 5 gallons each is approximately one shilling at wholesale rates.

If it is desired to add some slight waterproofing properties to this dressing, ¼ lb. glue size or gelatin may be dissolved in a small quantity of the water heated for the purpose and added to the lead acetate solution.

Shirlan.

Shirlan is the proprietary name for a chemical substance which was first used and manufactured in England for restricting mildew development in cotton and woollen cloth. Later it was also found

useful as a fungicide for certain plant diseases. Cunningham[2] reports that Neil in New Zealand has found the water soluble form of Shirlan to be effective in protecting the canvas of tents against mould attack. In the experiments reported here an insoluble form known as Shirlan AG. was chiefly used. This consists of 25 per cent. salicylanilide together with a wetting and spreading agent. It may be obtained in Queensland at a cost of 9s. per 2 lb. tin.

For calico treatment it is recommended that the Shirlan AG be added to the required amount of water at the rate of 1 per cent. by weight. That is to say, ½ lb. of Shirlan AG. (one-quarter of a 2-lb. tin) is required for 5 gallons of water. When bought, the Shirlan may have settled hard in the tin and some care will be necessary to ensure that it is all stirred up before removing the quantity required. The calico is immersed in the mixture and kneaded well so as to ensure thorough wetting and to remove the sizing material. After it has been soaked for half-an-hour or so the cover can be hung out to dry.

As mentioned before it may be necessary in the case of both dressings to repeat the treatment each season in order to compensate for the leaching effects of heavy rain.

In putting down the seed-beds sufficient space should be left to enable the covers, when removed for ventilation, to be laid back to dry if necessary. Rolling the covers up tightly when they are wet with dew and rain, and leaving them thus for long periods, is very conducive to mildew development.

REFERENCES.

1. Angell, H. R., A. V. Hill and J. M. Allan—Downy Mildew (Blue Mould) of Tobacco: Its Control by Benzol and Toluol Vapours in Covered Seed-beds. Journ. Council Sci. and Ind. Res., VIII., 3, 203-214. 1935.
2. Cunningham, G. H.—Plant Protection by the Aid of Therapeutants. p. 188, 1935.
3. Henley's Twentieth Century Book of Formulas, Processes and Trade Secrets. p. 749.
4. Holden, H. J.—Boy Scouts of America. 27th edition, p. 278, 1923.
5. May, R. G.—Prevention of Blue Mould of Tobacco. Agric. Gaz. N.S.W. XLIV., 10, 745-748. 1933.
6. Sharp, A.—Tobacco Seed-bed Covers. Journ. Dept. Agric., W.A. XIII., 4, 503-507. 1936.

DIGESTIVE DERANGEMENTS IN HORSES.

Most derangements of the digestive organs of horses are due to errors in diet, and a good and regular system of feeding will do more to prevent digestive disease than anything else.

The following rules for feeding are generally accepted as correct:—

Water before feeding, and not for at least an hour after.

Feed in small quantities, and often.

Do not work hard immediately after a full feed.

Never give a horse large quantities of food to which it is not accustomed.

If these rules are followed, and care taken to ensure that only sound, good food is fed, very little trouble will be experienced.

The Avocado.

R. L. PREST, Instructor in Fruit Culture.

HORTICULTURALLY the avocado is a comparatively new fruit, particularly to Queensland. Its native home is generally conceded to be tropical America. Botanically the avocado is related to the laurel family, and early classification placed all varieties in one species, *Persea americana*. More recent studies, however, have resulted in making two distinct species, *P. americana* and *P. drymifolia*, the former including all varieties horticulturally grouped in the West Indian and Guatemalan races, and the latter including the small-fruited varieties of the Mexican highlands. The characteristics of these three races are—

(*a*) *West Indian race.*—Summer and autumn ripening, fruit large, with skin 1/16th to ¼ inch thick and leathery;

(*b*) *Guatemalan race.*—Winter and spring maturing, fruit large, with skin 1/16th to ¼ inch thick and woody in texture;

(*c*) *Mexican race.*—Leaves small and anise scented, fruit small and thin-skinned.

The tree is an evergreen, though some varieties shed nearly all their foliage for a brief period during flowering. The leaf blades are of many different shapes, e.g., oval, ovate, obovate, lanceolate, and elliptic, and in length they vary from 3 to 16 inches. The colour of the mature foliage is usually a bright green, and young foliage may exhibit various shades of red and bronze. The manner of growth of the trees varies considerably; the tall upright unbranched habit and the small well-branched spreading habit are both commonly met with.

The fruits in the cultivated species are extremely variable in size, shape and colour. In shape they may be round, oval or bottle-necked, or in any of the numerous graduations between these forms. The colour ranges from light yellowish-green through dark green, maroon, brown and reddish-brown to purplish black. The skin of the Mexican varieties is thin, whilst that of the Guatemalan varieties is thick, tough and even woody.

The edible portion of the avocado is the fleshy part lying between the skin and the seed, and is of a buttery consistency, from creamy to bright yellow in colour and often greenish near the skin. It contains a high percentage of oil. Normally each fruit contains only one seed, the seeds of the different varieties varying considerably in shape. The seed is inverted in the fruit so that the base is on the side away from the stem end. The seed is often covered with two seed coats of varying thickness.

In addition to being a fruit of merit, the avocado is an extremely nutritious food, and a particularly valuable addition to the dietary of a State such as Queensland with its sub-tropical to tropical climate. In Queensland the avocado is used chiefly as a salad. Because of the high fat content of many varieties, the avocado combines best with such sub-acid fruits and vegetables as oranges, grapefruit, lemons and tomatoes, although some orientals prefer sugar on it instead of an acid substance. Combined with catsup, lemon juice, vinegar or onion, the avocado makes a delicious sandwich spread. It may be served with sliced tomato; or, combined with cabbage, celery, cucumber and onion, it may be used for stuffing whole tomatoes. If preferred sweet rather than with acid combinations, avocado may be combined with apple or banana.

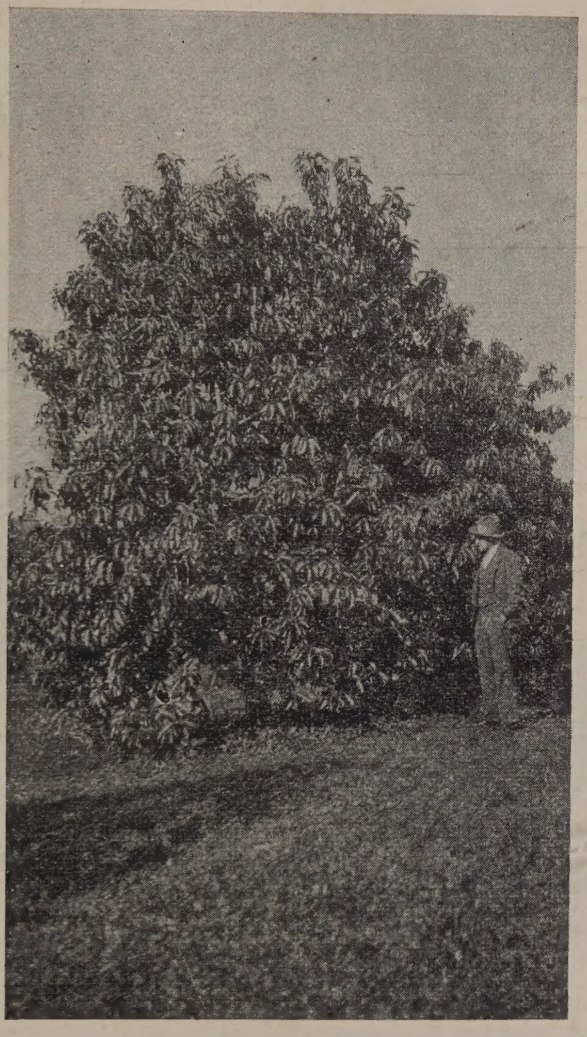


Plate 35.
An Eight-year-old Grafted Avocado.

The following are interesting recipes:—

Avocado pineapple salad (Six Servings)—

1½ cups grapefruit sections.
1½ cups orange sections.
¾ cup ripe mango slices.
1 cup avocado slices.

Remove membrane from the orange and grapefruit sections; chill all the ingredients, arrange on lettuce leaves, and serve with French dressing or mayonnaise.

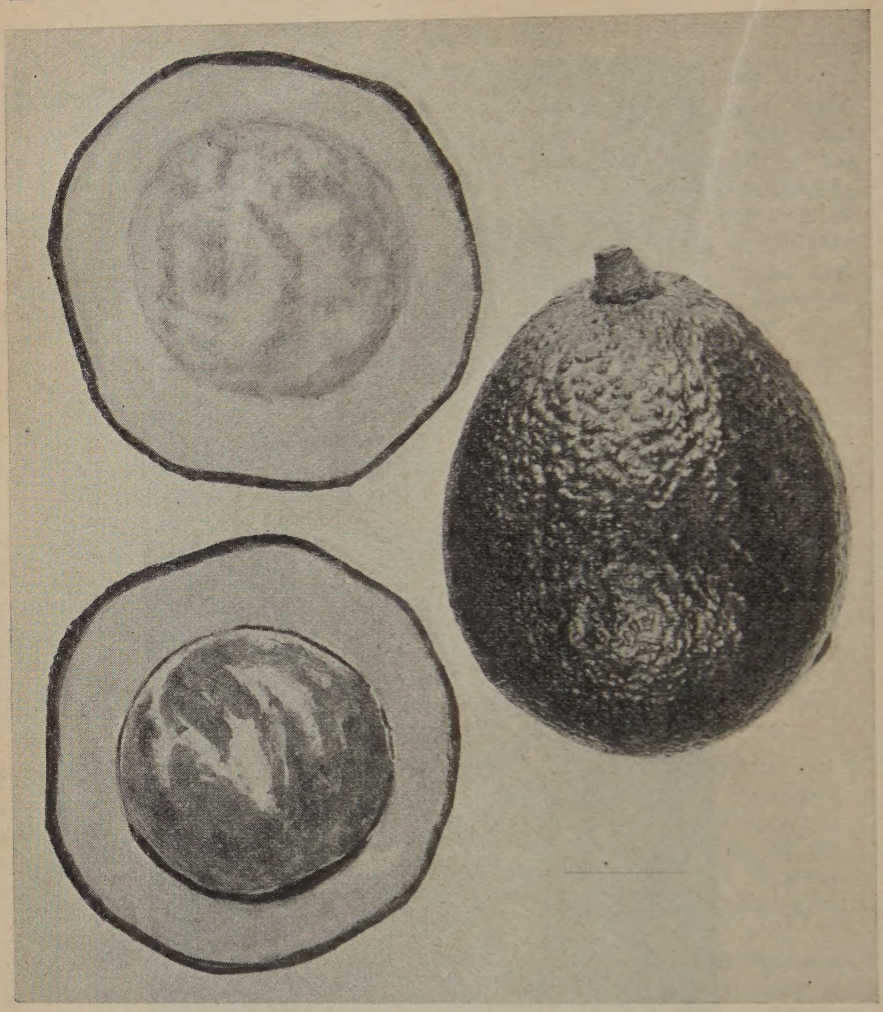


Plate 36.
Avocado Fruit, and Fruit Cut transversely showing Seed in Lower Section.

Avocado cocktail (Six Servings)—

- 4½ cups sliced avocado.
- 1 cup tomato catsup.
- 1 teaspoonful finely-chopped onion or juice.
- 1½ tablespoonful lemon juice.
- ½ teaspoonful Worcestershire sauce.
- ½ teaspoonful salt.

Sprinkle the salt over the avocado and chill; combine the other ingredients, chill and pour over avocado just before serving.

Numerous varieties of avocados have been introduced into Queensland, but many have been discarded for various reasons. Trial plots have been planted, and those varieties which promise to be suitable are being worked and kept under observation. Although at present no definite recommendations can be made, intending planters should confine their selection to such varieties as Grande, Queen, Spinke, Blakeman and Wilsonia, which, from the data available, appear to indicate some measure of suitability for the foothills on the North and South Coast of Queensland.

Sown Pastures and their Management.

C. W. WINDERS, B.Sc.Agr., Assistant Agrostologist.

[*Continued from p. 15, Part 1, Vol. XLVIII.—July*, 1937.]

(Part II.)

PASTURE MIXTURES.

AN ideal pasture plant would require, amongst other things, to produce heavily throughout the whole year and to constitute in itself a balanced ration for stock in production. No such plant may be found amongst the common pasture plants, nor, indeed, does any such exist. A near approach to the ideal pasture is attainable in certain areas by sowing a mixture of spring-summer-autumn and autumn-winter-spring growers, clovers or other legumes being blended with grasses.

A word of explanation should be offered here on the value of legumes in mixed pastures. Most dairy farmers and stockraisers know that the major portion of the ration fed to animals should consist of carbohydrates and fats (energy-producing and fat-forming materials), proteins (essential to tissue-building, wool growth, milk production, &c.), and minerals (required for bone formation and other purposes), in proportions which vary with the class of stock fed and the purpose of feeding. In a general way the proportion of proteins to carbohydrates and fats is fairly low in grasses (except in the very young growth) and a pure grass pasture does not provide a properly balanced ration. On the other hand, clovers, lucerne, and other pasture plants belonging to the legume family have a high proportion of proteins to carbohydrates and fats, and these, too, do not form a balanced ration. The requisite proportions of proteins and carbohydrates and fats may be secured in a mixed ration of grasses and legumes, and this is one reason why mixed pastures of grasses and legumes are so desirable. Further, most of the legumes possess a higher proportion of useful minerals than do the grasses and this enchances the feeding value of the mixed pasture generally.

The explanation of the higher protein content of legumes lies in the little growth or nodules which are found on the roots of leguminous plants. Within these nodules occur bacteria which have the power, not possessed by flowering plants, of collecting nitrogen from the air and changing it into a nutrient form. Portion of this transformed nitrogen is taken up by the leguminous plant and built up into proteins, and portion is transferred, either directly or indirectly, to grasses and other non-legumes growing with the legumes. The effect of this supply of nitrogen fertilizing material on grasses is to keep them in a condition of high production (provided other nutrient materials, such as phosphates and potash, are present in the soil in ample quantities), and so the decline in productivity of a pure grass pasture due to rapid depletion of nutrient nitrogen in the soil may be arrested to some extent by incorporating in the pasture a legume which will build up the supply of nutrient nitrogen in the soil by liberating nitrogen taken from the air, and changed into useful nitrogen compounds by the nodule bacteria. Occasionally it is found that lucerne and other legumes when planted on new fertile land in apparently suitable districts do not thrive, and examination shows that the nodules are absent from the roots. In such

cases it is necessary to add the requisite bacteria to the seed before sowing, and cultures of these bacteria are prepared for seed inoculation purposes in most States.

From what has already been written it is obvious that mixtures of grasses and legumes provide a better balanced ration than do pastures composed of a single species, and the legumes assist in maintaining the nitrogen content of the soil.

Plate 37.
A freshly-burnt "scrub" area.

Pasture mixtures are desirable also from the point of view of spreading production over the longest possible period of the year. Examples of this are provided by paspalum-white clover pastures (plate 37), where the clover provides grazing during portion of the dormant period of the grass, and by Wimmera ryegrass-lucerne pastures in which the ryegrass is productive during the winter months when the lucerne is at a standstill.

In Queensland, however, the sowing down of mixtures of summer and winter growers is not always successful. Some of our warm season grasses are so aggressive during the wet, summer months that they crowd out most of the pasture plants which are dormant during the warmer period of the year. In addition, the rainfall during the winter months is often too low to permit of the growth of winter-growing pasture plants. However, in some districts the sowing down of winter-growing grasses and clovers in admixture with summer-growing pasture plants is effective in extending the productive period of pasture growth.

On land which varies in soil type from place to place, the sowing down of a mixture of plants is preferable to seeding pure stands, since plants suitable to the different patches are likely to be included in the mixture and a more uniform stand will result.

Simplicity should, however, be the keynote of pasture mixtures. It is usually cheaper, and preferable in most other respects, to sow simple mixtures than to plant complicated mixtures which sooner or later will come to consist of only a few species.

Plate 38.

Sowing Rhodes grass on rotting prickly-pear in brigalow and belah "scrub" in the Maranoa.

SOIL FERTILITY.

A major consideration in the laying down of artificial pastures is the selection of land to be used for the purpose. It is an established fact that pastures make heavy demands upon plant foods contained in the soil, and although a good deal is returned to the soil in the form of animal excreta and plant trash (including decayed roots), much is removed from pasture areas as beef, milk, mutton, wool, &c. Pasture is thus comparable in some respects to harvested crops and, where soil fertility is concerned, should be treated as a crop. In the old agricultural countries, of necessity, pasture has been accorded something approaching crop treatment for years past; but, in Australia, "grass farming" is only now commencing to supersede "grazing" in the more favoured districts.

In view of the high requirements of the better-class pasture plants in respect of foods supplied by the soil, sowings of permanent pastures should be restricted to lands of sufficient fertility to maintain the pastures at a high level of production for several years. As with crop plants, different pasture plants thrive under different degrees of soil fertility. Some demand a very fertile soil; others will tolerate lower fertility conditions. As a general rule, however, the richest soils will produce the best pastures.

Sown pastures are generally established to fulfil one of two conditions, viz:—

(1) To convert virgin timbered country to grazing land within a few months, the settler, pioneering his holding, requiring a cash return within a short period (plates 35 and 36).

(2) To improve timbered, or poorly-grassed, portions of holdings already developed to an appreciable extent, the provision of the improved grazing not being an urgent necessity.

Plate 39.
A mixed paspalum-white clover pasture in the Maleny district.

Where pioneering conditions prevail, the short cut methods of pasture establishment must continue to operate in many instances. Quite apart from the necessity of obtaining pasturage as early as possible, there is justification for the immediate sowing of pasture on freshly-burnt softwood and heavy brigalow scrub areas. Such soils generally are rich in plant foods and the fertility of the land is improved by the addition of ashes from the burnt timber. Moreover, these soils naturally are fairly retentive of moisture. These factors of high initial soil fertility, and abundant moisture content, enable fairly long-lived stands of pasture to be obtained. After some years, however, the initial high fertility of the soil, and its water-absorbing capacity, will have become depleted to some extent and steps will have to be taken, where practicable, to arrest pasture deterioration.

In the case of pasture improvement upon partly-developed properties, a policy of gradually establishing first-class grazing areas should be adopted in preference to one involving the wholesale sowing of

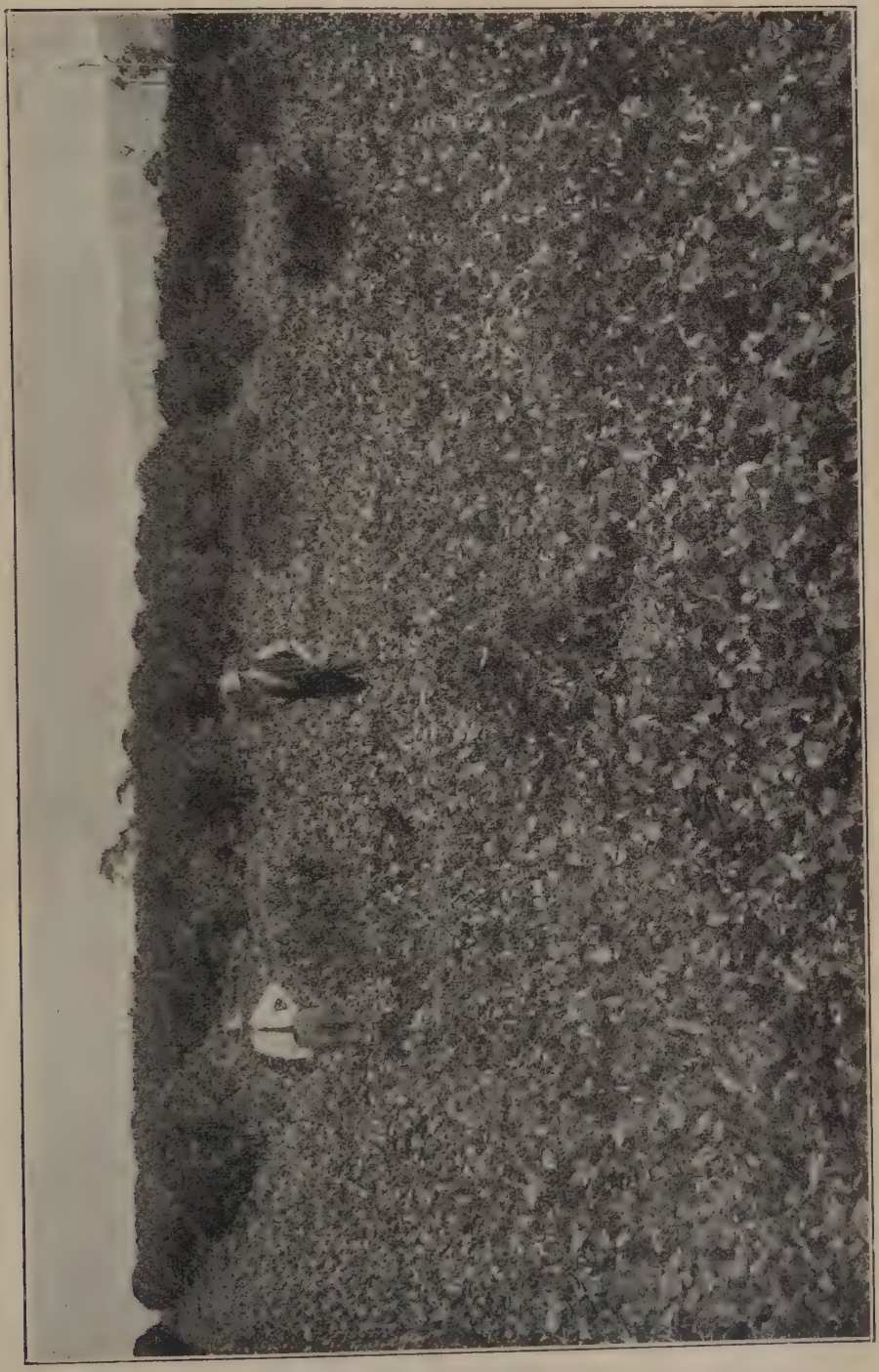


Plate 40.
Cowpeas sown for green manuring purposes.

pastures which will soon become second-class. This applies to the replacement of deteriorated sown and native pastures as well as to the grassing of timbered country. The difference in value between land in first-class condition for pasture, and second-rate land, far outweighs the cost of improving the latter. Naturally, the most fertile areas available on any particular property for pasture sowing should be selected for improvement purposes and the lower class land left alone for the time being. The objective should be efficiently subdivided pastures on fertile, cultivable land which may be cropped and over which a mower may be run.

Methods suitable for bringing various soils into a condition satisfactory for permanent pastures have not yet been worked out in detail for all districts, though much progress has been made in investigations with Rhodes grass pastures at the Callide Cotton Research Station at Biloela. Experience at this centre, and elsewhere, indicates that grass pastures are limited in longevity and productiveness by the supply of available soil nitrates, on which grasses and similar plants are heavy feeders.

The main sources of nitrates in the soil are:—

(*a*) Organic matter, decomposed by the action of certain bacteria with the formation of nitrates, &c., and

(*b*) Nitrogen of the air, converted into nutrient form chiefly by bacteria living in the roots of certain legumes and by a few other bacteria.

The continued production of nitrates from organic matter results eventually in a serious depletion of the organic matter contained in the soil. The effects are a lessened amount of nitrate available to the plants and deterioration in the physical condition of the soil, clay soils setting into hard masses which permit only steady rains to penetrate.

The problem of preparing soils for permanent grass pastures is thus largely one of increasing the nitrate content and the amount of organic matter to a suitable extent. Probably the best means of achieving this are:—

(*a*) Green manuring, both organic matter and available nitrates being increased if a leguminous crop is used for the purpose; (plate 38).

(*b*) Cropping for a certain period with a leguminous cash or fodder crop, such as lucerne or clovers, the nitrate content being increased by the activity of the root-infesting bacteria and the dead roots adding organic matter; and

(*c*) Growing of a row crop demanding relatively little nitrate, the intense cultivation of the soil stimulating the production of nitrates from organic matter already in the soil.

The exact methods that should be adopted have yet to be elaborated for different conditions, but sufficient has been written to indicate that soil fertility is a major consideration in the laying down of pastures.

PREPARATION OF SEED-BED.

Different types of seedbed, varying from uncultivated forest land to the onion-bed type, are employed for sown pastures. The seedbed provided by uncleared forest land, even if some harrowing has been

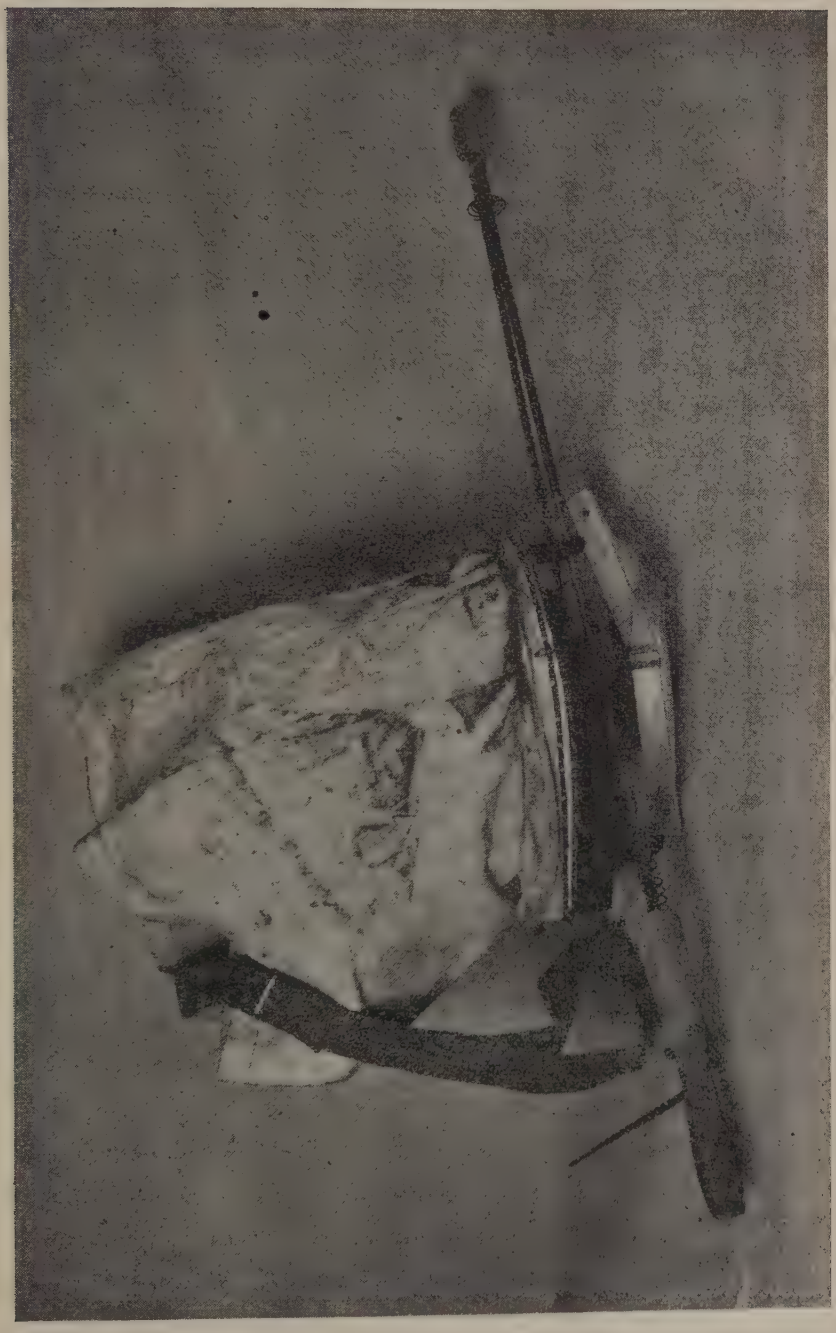


Plate 41.
The fiddle type of seed-sower.

carried out, is quite unsuited for pasture establishment. In addition to the fairly low fertility of the land usually found, the competition of native grasses and undergrowth prevents the satisfactory establishment of sown species. Likewise, established pastures of native or other grasses are not receptive of additional pasture plants unless a disturbed seedbed is provided and a temporary check given to the growth of the established plants by severe harrowing. Under certain conditions wood ashes on burnt-over areas form quite a good seedbed.

Plate 42.
A popular type of hand-operated seed broadcasting machine.

By far the best seedbed is that resulting from the efficient tillage of fertile soil. Most of the common pasture plants have small seeds and require a seedbed of fine tilth. By compacting the soil close to the surface a seedbed is provided which is favourable to the fine, early

root systems of the pasture plants. The seedbed should also be provided with ample moisture and in dry districts, particularly, cultural operations throughout the seedbed preparation period should be carried out with due regard to the conservation of moisture. Ploughing well in advance of sowing is desirable, and the land should be allowed to lie in the rough state for a few weeks before further cultivation is undertaken. Heavy peg harrows or a springtooth cultivator will be required to break down the clods. Subsequent working should aim at destroying weeds and compacting the sub-surface soil, and shallow harrowings with the peg harrow or springtooth will assist in this direction. If the land becomes weedy and the surface sets hard, a disc harrow may be necessary to destroy the weeds. Rolling prior to sowing may be desirable in cases where the ordinary cultivation has not sufficed to form a fine seedbed.

If a pasture is to be established from cuttings, plantlets or crown divisions there is not the same necessity for compacting the soil, though moisture conservation, weed destruction and the avoidance of a loose, spongy soil condition are desirable. Under special circumstances the planting of vegetative material may be carried out on rough, and on timbered country, with some prospects of successful establishment, but wherever possible well-worked land should be provided.

METHODS OF SOWING AND PLANTING.

Whilst hand-broadcasting is still the commonest means of sowing pasture seeds in Queensland, the adaptation of drills and manure spreaders for the purpose is now being exploited. Broadcasting seed by hand (plate 36) is fairly satisfactory when carried out on a still day, provided that separate sowings are made of grass seeds and of "shotty" seeds such as those of lucerne and clovers. Hand-broadcasting is the most practicable method of sowing such seeds as those of Rhodes grass and molasses grass. Sometimes it is advisable to mix the seeds with superphosphate or with sand in order to secure a uniform stand. Special hand-operated broadcasting machines (plates 39 and 40) are useful for certain seeds.

Special pasture seed attachments are obtainable for fitting to cereal drills, but are not recommended for use with grass seeds which bunch together. Where the special lucerne and grass seeder is not fitted, pasture seeds of suitable type may be sown through the fertiliser box of the ordinary cereal seed drill. The seed must, however, be mixed with fertiliser or sand, and the mixture constantly agitated. When a drill is used for sowing pasture seeds the discs or hoes should be adjusted to run very shallowly or even along the surface of the land, otherwise the seed will be buried too deeply. Sowing in drills is more economical of seed than is broadcasting.

Manure spreaders can also be utilised for distributing pasture seeds. Where seed is being sown in admixture with fertiliser certain precautions should be taken in order that the viability of the seed may remain unimpaired. Seed should not be placed in close contact with moist fertilisers, and when mixed with dry materials, such as superphosphate, should be sown within a day or two of mixing.

Whilst some seeds may be sown on the surface of the soil and allowed to become buried by natural means, it is generally advisable to cover the seeds immediately after sowing. In addition to bringing the seeds into close contact with the moist soil, covering protects the

seed from destruction by birds and ants. In covering small seeds, care must be taken that they are not buried deeper than about one-half inch below the surface of the compacted soil, otherwise the tender shoots may not be able to push through to the surface. If the loose surface mulch is shallow a light rolling or harrowing with light peg or brush harrows is effective in covering the seed, but where the compacted layer is deeper a long-toothed harrow may be necessary. If the surface mulch is too fine and cakes after rain only a very light covering should be given to the seeds. Except on soils which cake on rolling, a light rolling after sowing is often useful in compacting the soil about the seeds. If the soil is somewhat dry a harrowing should precede the rolling. On sheep properties a fairly common method of covering pasture seeds sown on the surface is to run a big mob of sheep over the paddock to trample under the seed, but the stock should not be allowed on the area long enough to consolidate the soil.

Various methods are adopted for planting cuttings, crown divisions or plantlets. The planting material may be "dibbled in" (that is, placed in a hole made with a sharp stick, a hoe or a mattock) or planted in furrows on cultivated land. Whatever type of material is used, the soil must be firmed around the sett by tramping or rolling. Cuttings strike at the joints and should be planted so that at least one joint is below the surface of the soil. The method recommended in South Africa* for planting plantlets and pieces of tufts of plants is as follows: The plants are set out in holes in lines across the field. The holes are made by means of a hoe, the operator walking along the line and making a hole at each step. The correct method of hoeing is to use the hoe with its head at right angles to the line. In planting, the planter works along the line, places the plant against the hard far edge of the hole, fills up the hole and compacts the soil with all his weight on his right foot while putting in the next plant. To avoid setting the plants too deeply the grass should be held from above, but close to the crown, so that the knuckles of the hand are on top of the ground when the plant is being set.

PASTURE MANAGEMENT.

General Principles.

The aims of pasture management are twofold: first to increase the carrying capacity of the pasture to its maximum, and to maintain it at that level; and secondly, to prevent the pasture from deteriorating and, if possible, to improve it. These two aims should be pursued concurrently. The production of animal products, such as wool, mutton, beef, milk or cream should not be made at the expense of the quality of the pasture. The system of pasture management followed should be such as to give due recognition to the demands of both the stock and the pastures.

What is known as the "intensive system of pasture management" embodies all the refinements of good grazing practice, but some modifications are necessary in Queensland. The intensive system, which was evolved in Germany during the great war, employs scientific methods of feeding pasture to stock. The object is systematically to feed off the pasture at the stage of maximum food value, and to accomplish this it is necessary to concentrate stock upon the pastures at many times the normal rate, for periods correspondingly shortened for each paddock.

* J. A. Pentz: "South African Pasture Grasses together with a Survey of the Work on Prinohof Pasture Experiment Station." Bul. No. 148 of the Union of South Africa Department of Agriculture and Forestry.

This necessitates the provision of a number of paddocks and their rotational grazing. On dairy farms in those countries where, because of regular and uniform rainfall, it is possible to adhere to an orderly plan of rotation, it is usual either to follow the milkers with dry cattle to clean up any rough herbage or to level the rough grass by mowing. Other important aspects of the system are the conservation of the surplus grass produced in the flush of the year, harrowing after grazing to distribute dung, renovating to reinvigorate the pasture, and systematic topdressing with phosphatic, nitrogenous, and potassic manures.

Subdivision of Paddocks.

On many dairy farms it is usual to find a small number of large paddocks rather than a large number of small paddocks. The typical pasture conditions on such farms may be attributed to the lack of sufficient subdividing fences to permit of proper grazing management. Under the existing conditions of poorly controlled grazing the pastures, during the flush of their growth, consist characteristically of a series of closely grazed patches interspersed with rank growth which either is not eaten at all or is left until the following autumn or winter, by which time it has deteriorated greatly in food value. Often more than one-half of the pasture, towards the end of the main growing season, consists of untouched rank growth, and it therefore is easy to visualise the large amount of waste that occurs. (The ultimate fate of this excess growth, provided it is not burnt, is to build up the organic matter in the soil, and it is, therefore, not entirely wasted. The practice of adding organic matter, however, is much more effective if undertaken systematically rather than in a haphazard way.) The uneven grazing arises from the cow's preference for the short, leafy grass, which is usually more palatable and nutritious than the same grass when it has become rank and stemmy. When a cow is turned into a paddock which supplies a superabundance of feed she will graze the pasture in patches and will return again and again to these patches, neglecting the overgrown clumps. A similar state of affairs is observed on grazing properties of all descriptions.

As the first step towards keeping the pasture at the short, leafy stage, and ensuring the even grazing of a mixed pasture, it is necessary to provide a series of relatively small paddocks which may be grazed at will according to the stage of growth, infestation by disease, or other conditions. The extent of subdivision desirable depends on a number of factors, including the type of pasture, the class of stock, the size of the herd or flock and others. In all cases where intensive or semi-intensive production of livestock or livestock products is aimed at (i.e., on dairying, fat lamb, and beef fattening properties), greater returns may be expected from subdividing the better-class portions of the holding than from cutting up the inferior areas into small paddocks. First attention, therefore, should be given to the most productive areas.

Care must be exercised in planning the layout of the paddocks in order to provide for the most convenient movement of the stock and their easy access to water. When subdividing paddocks it is generally unnecessary to erect the same type of fence as is used on the boundary lines. Something better than the usual type of temporary fence is, however, required. Only one type of pasture should be included in each paddock. If one area of poor pasture and another of better pasture

occur in the one paddock the stock will neglect the inferior grass and concentrate upon the good pasture, to the detriment of the paddock as a whole. A similar distinction is shown in paddocks which have not been uniformly topdressed.

Rotational Grazing.

Since the object of securing a high measure of control of the grazing is to provide the short bite in a systematic manner, the pasture should not be allowed to grow rank, unpalatable and lacking in nutrition before being grazed. Usually a heavy concentration of stock for a few days on a paddock carrying young pasture, generally less than 12 inches tall, will clean the pasture up to the best advantage. When the pasture has been eaten down fairly closely the stock should be removed to another paddock and the eaten-down pasture permitted to develop a fresh growth before being again grazed. If a fresh young bite is to be available to the stock during most of the growing season of the pasture a fairly large number of paddocks will be necessary. Even on dairy farms in the districts most favoured by rainfall at least six paddocks should be provided.

The conception of grazing paddocks to a predetermined plan of rotation is generally inapplicable to Queensland conditions, but the purpose is served if each paddock is submitted to short and intermittent grazings rather than being grazed for long periods without interruption.

As a general rule, the young growth available in the small paddocks should be reserved for stock in production. If these do not graze the area evenly, dry and non-producing animals may be brought in to clean up the irregularities, or the mower may be used. Patches of long grass allowed to remain in the paddock will reduce the area of short, young pasture available during the next grazing period.

On well-subdivided farms, during the flush of the season, when it is difficult to keep the grass fed down, one or more of the paddocks could be shut up and the grass allowed to grow to the hay or silage stage when it might be mown for conservation.

Special care must be exercised in grazing pastures containing a high proportion of succulent legumes and clovers. Hungry ruminants ingesting a large quantity of succulent feed are apt to become "blown"; consequently, stock should be allowed on to legume-rich pastures for only fifteen to twenty minutes at a time, or they should not be put on until they are half full of grass or roughage.

Spreading Animal Droppings.

A paddock after being grazed has a scattering of droppings over its surface; but the extent to which the pasture can be benefited by distributing this manure before it becomes too hard is realised by too few farmers and graziers. The dung contains a fair proportion of the original food value of the grass and, if a dropping is allowed to lie undisturbed, the plant foods contained therein will lead to a rank growth of grass in that particular spot. This rank, patchy growth is not liked by stock, and if full advantage is to be taken of the manure available, the fertilizing ingredients must be more uniformly spread over the paddock. Distribution can be carried out by means of a special pasture harrow, or by running over the area an ordinary peg harrow

about which several lengths of barbed wire are loosely coiled. A weatherboard or other type of timber drag is quite satisfactory, but its use on wet dung in dry weather should be avoided in order to prevent the fouling of the pasture by extensive smearing.

Mechanical Treatment of Pastures.

In many countries the mechanical treatment of certain types of pastures has long been a feature of efficient pasture management. In Queensland the value of the practice in renovating paspalum pastures has been demonstrated, but so far little has been discovered in regard to its effects on other pasture types.

In the sod type of grass pasture, conditions unfavourable to maximum pasture growth commence to develop once the sward is well established. The complete covering given to the soil by the pasture in many instances acts as a thatch which diverts rain water from the surface and prevents its penetration into the soil. This effect is pronounced where storm rains, and not steady, soaking falls, are experienced. In neglected pastures (perhaps partly as a result of droughty conditions caused by poor moisture penetration) old and dead roots accumulate in the upper layer of the soil and interfere with the development of young roots and with the aeration of the soil. A reduction in the productivity of the pasture is the general result of the conditions described, and their amelioration is largely a matter of breaking up the matted grass and the few inches of soil at the top.

The implements used for this purpose are varied and include the plough, the rotary hoe, special tine cultivators, &c. Further details are given under the sections dealing with the individual pasture plants.

Lime and Fertilizer Treatments.

The establishment and the maintenance of productive pastures depend to a large extent upon the degree of soil acidity and the amounts of available plant foods in the soil. Different pasture plants have different requirements in regard to both soil acidity and soil nutrients, but most sown pastures may be improved by attention to one or the other of these factors or both.

The degree of soil acidity may conveniently be expressed numerically by what is known as the pH value. A soil neither acid nor alkaline in nature has a pH value of 7; values from 7 down to 0 constitute the acid range; whereas values from 7 to 14 comprise the alkaline range. Most soils have pH values between 4 and 8. Soils of pH 0 to 4·7 may be regarded as very strongly acid; soils of pH 4·7 to 5·2 as strongly acid; those of pH 5·2 to 5·8 as of medium acidity, of pH 5·8 to 6·4 as moderately acid, and of pH 6·4 to 7·0 as slightly acid. Slightly alkaline soils range from 7·0 to 7·5, soils of medium alkalinity from pH 7·5 to 8·2, and strongly alkaline soils greater than pH 8·2. According to the National Fertilizer Association of the U.S.A. the most suitable pH ranges for various pasture plants are as follows:—lucerne, 6·5 to 7·5; red clover, 6·0 to 7·0; white clover, 6·0 to 7·0; barley, 5·5 to 7·0; wheat, 5·5 to 7·0; cowpeas, 5·5 to 7·0; grasses, 5·5 to 7·0; lespedeza, 5·5 to 7·0; oats, 5·5 to 7·0; velvet bean, 5·5 to 6·5; and vetch, 5·5 to 6·5.

In a general way, soil acidity is related to rainfall conditions, the wet coastal areas having more acid soils than the drier inland areas.

Plate 43.

ADJACENT PASPALUM PADDOCKS ON AN EAST MORETON DAIRY FARM.—The clover-rich paddock on the right was treated with a mixed fertilizer; that on the left was not fertilized.

In the wet Babinda area cane soils of pH 3·8 to 5·4 are common; some of the Atherton Tableland pasture soils have a pH as low as 5·2; black soils in the Callide, Lockyer and other river valleys are alkaline in nature, as are the pasture soils of the west. The poor development of legumes in the coastal cultivated pastures may be bound up with acid soil conditions; certainly the reduction of acidity by applications of lime has increased the clover content in many instances. Where the soil is shown by an acidity test to be strongly acid, the effects of the applications of lime should be tried. The amount of lime which must be added to a soil to reduce its acidity by one or more units of pH depends upon the soil type and, until our experience has been increased, the amount of lime to be added can only be roughly gauged. Lime for agricultural purposes is on the market in a number of forms of widely varying agricultural value, and those interested in the subject should procure a copy of a pamphlet entitled "Lime for Agricultural Purposes" from the Department of Agriculture and Stock before purchasing their requirements.

Whilst a certain amount of experimental work in connection with the top-dressing of Queensland pastures has been carried out, the exact place of fertilizers in pasture management and improvement is by no means clear. In some districts the problem is complicated by the effect of soil acidity and other soil characteristics on the availability of applied fertilizers and much investigational work is required in these areas. One of the chief effects of certain fertilizers on temperate pastures—viz., the encouragement of clovers and other legumes—is nullified to some extent in many Queensland areas because of the general unsuitability of climatic conditions to the growth of useful pasture legumes. A third disturbing factor is the uncertainty of the rainfall, and a fourth lies in the poor condition of matted pastures for the reception of added fertilizers.

In spite of the difficulties mentioned, a certain amount of pasture is successfully treated with fertilizers (plate 41) and it is fairly obvious that the practice must eventually become a regular feature of pasture management, at least in certain areas. The plant foods usually employed in fertilizers for stimulating pasture production are phosphate and nitrogen. The special effects of phosphatic fertilizers on pastures are the encouragement of root development in the seedlings and of legume growth. Nitrogenous fertilizers are especially valuable in promoting the leaf growth of grasses. Both kinds of materials increase palatability, feeding value and general productivity of pastures.

There are several methods of applying lime and fertilizers to pasture land. Hand-broadcasting from a bucket or bag is very tedious work and, on a windy day, unpleasant, but where small areas are being top-dressed it is the method commonly employed. An alternative means of top-dressing small areas is to employ a knapsack fertilizer broadcaster, of which several makes are available. For top-dressing large areas, specially designed machines are on the market. These are of two general types, namely, spreaders, and broadcasters.

The general form of broadcaster is a hopper fitted with a distributor disc designed to be driven from the wheel of the cart or lorry on which

the hopper is intended to be mounted. (This type of broadcaster can also be obtained mounted on its own chassis.) The fertilizer is thrown to both sides of the machine by the revolving distributor disc. Even distribution and regular cover are somewhat difficult to obtain because of the influence of wind on the cast and the difficulty of driving to the line of the throw of the previous round. On rough country, however, these machines are very useful.

The fertilizer spreader is a self-contained machine. The fertilizer is released from the box by the movements of a "star" feed, or of an endless chain, and drops directly to the ground. An alternative machine to the special spreader is the ordinary wheat drill, but the draught of the latter is considerable when compared with that of the light spreader.

Where both lime and superphosphate are to be applied to a pasture, the application of the former should precede that of the superphosphate by as long a period as is possible. If the two substances are applied simultaneously the lime may cause portion of the superphosphate to revert from the useful water-soluble form to the less readily available citric acid soluble form.

Burning of Pastures.

The burning of paspalum, Rhodes grass and other cultivated pastures with the objects of getting rid of accumulated trash and coarse, dry material, and of encouraging the production of an early "bite" in the spring, is quite common in Queensland. Insufficient information is available to indicate precisely what is the effect of burning on such pastures, but there is no doubt that firing results in the destruction of a large amount of organic matter and probably has other harmful effects if regularly carried out. There is much to be said in favour of the view that the benefits obtainable from burning could be secured with fewer harmful effects by the adoption of a system of pasture management involving intermittent heavy grazing, the use of the mower, and the harrowing of the pastures.

Miscellaneous Aspects of Pasture Management.

Suitable shade should be provided for the stock in hot weather and shelters for their protection during cold weather. The location of these resting places should be chosen with a thought to the conservation of the animals' excreta. If the paddock slopes to a stream the animals should be encouraged to rest near the top of the slope, since, if they camp along the watercourses, heavy rains will wash the droppings away and remove a large amount of fertilizing material which otherwise could be retained on the pasture areas.

The several classes of livestock have different grazing habits and a proper appreciation of these habits will enable a much better utilisation of the pasture resources on a property to be achieved. Cattle are perhaps the most efficient grazers, inasmuch as they graze more uniformly than other classes of livestock. Sheep are more selective in their grazing, paying the greatest attention to the finer constituents of the pasture and neglecting the coarser plants. Horse paddocks usually deteriorate much more rapidly than other pastures, the horses allowing the coarser grasses to increase by neglecting them in favour of the fine grasses, which

are eventually eaten out altogether. Sheep and goats eat some weeds and shrubs more readily than larger stock, and so are useful on dairy farms for cleaning up weedy pastures.

For most types of pasture it is found that most efficient grazing is attained by carrying two or three classes of livestock, but this is not always practicable. Pastures in parts of the Maranoa and Darling Downs, many of which are used for sheep-raising, require after an exceptionally favourable period of rainfall to be eaten off by cattle before the sheep can make good use of them.

[TO BE CONTINUED.]

PIGMENTS IN MILK.

Milk contains two kinds of colouring substances, one of which is soluble in water, and the other soluble in butterfat. The water soluble pigment is called lactochrome and its greenish-yellow colour may always be seen in whey during cheese manufacture. The pigment soluble in fat is yellow in colour, and is more interesting and important on account of its presence in butter. It is called carotin, and belongs to a group of colouring substances called carotinoids, which are widely distributed in plants and are also found in many animals. Carotin for example is also responsible for the yellowish colour of the fatty tissue and skin secretion of dairy cattle, especially Jerseys and Guernseys. Another carotinoid, which is very closely related to carotin and which is called lycopin, causes the red colour of tomatoes, watermelons, and other fruits, but has not been found to occur in animals or milk.

Carotin is found in all green plants, being manufactured by the plants themselves, but it is not manufactured in the body of animals. The presence of carotin in milk fat is therefore due to a direct transfer of this colouring substance from the food eaten by the cow.

This has been proved quite definitely by feeding experiments, which have shown that the amount of carotin in the fat increases or decreases, according to the amount of carotin present in the food. When cows are fed on such foods as cottonseed meal, timothy hay, white corn and yellow corn, the amount of carotin found in milk fat is very low compared with that obtained from cows fed on green lucerne hay, green crops, fresh pasture grass, and similar foods.

This offers an explanation of the seasonal variation in the natural colour of butter, and also indicates why butter from some districts is more yellow than butter from other districts. In those areas with a good annual rainfall and consequently a plentiful supply of green pasture, the colour of butter is always brighter than that produced in the drier parts of the State.

The various breeds of dairy cattle differ with respect to the amount of this yellow colouring substance in butter fat. Guernseys and Jerseys rank first in this respect, with Ayrshires, Shorthorns and Friesians lower down on the scale. Another interesting feature about this pigment is that, of all the animals whose milk is commonly used for human food, cows alone give milk which has a pronounced yellow colouration of the fat. Milk fat from the goat, ewe, camel, and water buffalo is almost entirely devoid of yellow colouring matter. The fat of human milk, however, is at times distinctly tinted by carotinoids. The reasons why such differences occur is not known.

A point of great interest and importance also is the relationship between carotin and vitamins in milk and butter. It has been shown that carotin can be transformed into vitamin A by the cow itself. The yellow colour of butter such as is often seen in spring and summer-time, is therefore suggestive of richness in vitamins, and vitamin content is one of the best arguments for butter as a fatty food for children and adults.

O. St. J. Kent.

Sheep Grazing at the Mackay Experiment Station.*

D. L. McBRYDE.

THE necessity for diverting cane lands from the production of "excess" sugar into more profitable channels has been considered carefully by the Bureau, and canegrowers will probably be interested in the experiment which was undertaken at the Mackay Sugar Experiment Station, Te Kowai, during the spring of 1936. It marks an attempt to determine the value of the Mackay lands for pasture production, in a project which aims at breeding suitable types of cross-bred lambs, and fattening them for the market. The Minister for Agriculture and Stock (Hon. F. W. Bulcock) was closely associated with the initiation of the plan, and we are indebted to the Minister for his sustained interest and assistance in the work.

A block of 16 acres, situated on the poorest and wettest portion of the experiment station, was selected for the purpose, so that the tests are being conducted under rigorous conditions. The block has been subdivided into 8 sections, each 2 acres in area. When the rotation has been established, one section will be under plant cane, one under first ratoons, and the balance in grass, or in process of preparation for pasture or cane. The eight plots will thus have produced two crops of cane in the eight years of the rotation. The object of the trial is thus twofold—firstly, to produce cane, and, secondly, to devote the land to some profitable form of grazing while its fertility is being built up under pasture. The latter phase will be assisted still further by the judicious sowing and ploughing under, or feeding off, of leguminous crops.

At the present time four sections (about 8 acres) are fenced off as a grazing area. Here grasses are very well established—mainly *Panicum muticum* and Guinea grass. Portion of the present grazing area carries a rank growth of these species, while the balance was cut or burned off during 1936. The standover grass is too heavy and thick to permit the sheep to travel through it, and it will be burned off as soon as conditions will permit. Even the new growth grew so rapidly that the sheep were forced to keep to the tracks which they had beaten through it. This has since been mown to improve conditions.

The area is very wet and attention is being paid to the improvement of drainage conditions. Twice in recent months the entire paddock has been inundated by flood waters. On the first occasion twelve inches of water stood on the block for about twelve hours, while again in March there were several inches of water in all parts of the paddock for three days. This second flooding came at the conclusion of a wet period of about two weeks, during which the coats of the sheep were continuously saturated by the showery conditions.

Twenty-five ewes, 2-, 4-, and 6-tooths, were chosen from the flock of Mr. J. Jones, North Eton, for the purpose of the experiment. These animals are Merino-Corriedales, which were bred and reared on the Eton property. The ram is a stud animal, of the Romney Marsh breed, which was despatched from Southern Queensland to run with the ewes.

* In *The Cane Growers' Quarterly Bulletin* (Bureau of Sugar Experiment Stations), July, 1937.

Plate 44.

Flock of Merino-Corriedale ewes at Mackay Experiment Station.

Despite the trying conditions which the sheep have passed through, recent inspection by Veterinary Officer Irving, of Rockhampton, proved that there was no sign of foot-rot, worms, or fly-blowing in the mob, and that all the animals were in excellent condition and quite normal in all respects.

The accompanying photographs were taken early in April, 1937.

Plate 45.

Romney Marsh ram at the Mackay Experiment Station.

Common Milk and Cream Taints.

M. J. GRIFFITHS, B.Sc. (Dairying), Dairy Research Laboratory.

THE causes of undesirable or "off" flavours in milk and cream may be broadly grouped into—

A. Bacterial taints,

B. Those due to physiological disturbance,

C. Feed flavours,

D. Those due to traces of metals,

E. Absorbed flavours,

although it does not follow that one fault is always due to the same cause. Bitterness, for instance, may be either physiological, bacterial, or a feed taint.

Unclean or "Cowy" Odours.

Bacteria common in the cow-shed, present in manure, and carried about on dried dust particles in the atmosphere, on the cows' coats, and by milk utensils, are responsible for the unpleasant smell and taste variously described as "farmyard," "cowy," or "unclean," which is followed by souring with gassiness. These are not found in carefully produced milk and cream where conditions are hygenic.

Soapy Flavour.

Overneutralising of cream (or milk) may result in soapiness, which is actually a combination of part of the fat present with the alkaline neutraliser. In rare cases it is caused by an ammonia-forming group of bacteria, and it may show up in cooled milk when the normal souring group is not active.

Bitter Flavour.

There are several causes of bitterness developing in milk and cream. It may be due to a type of yeast, or to bacteria, usually of the spore-forming type, capable of breaking down the protein into bitter-tasting substances—this often occurs in pasteurised milk and cream where the normal acid-forming types have been destroyed.

Certain feeds, notably thistles, lupins, and vetches, if fed shortly before milking, have been found to produce a bitter taint in milk, the essential oils passing through from the blood stream unchanged. If it is possible to prevent the cow from consuming these feeds within three to four hours of milking, these substances have time to be dealt with by the body and are not secreted in the milk.

Mastitis Milk.

Both bitter and salty tastes result from the udder inflammation known as mastitis, mammitis, or garget. In the early stages, mastitis milk may be difficult to detect and separate from the rest, unless the first-drawn milk is carefully examined, when minute clots may be detected. Cream separated from mastitis milk has a flat, disagreeable flavour, due to the absence of normal acid-formation. Mastitis milk is unsuitable for cheese-making or for consumption, though it may be possible, if the infection is only slight, to pasteurise and use it for stock-feeding.

Late Lactation Milk.

Saltiness is also met with in milk from cows well advanced in lactation. The salt content of milk is a very variable quantity and reacts to any physical abnormality. Towards the end of the lactation period a large proportion of the potassium and phosphates are being used up in nourishing the young calf and are not secreted in the milk, so that the sodium chloride is proportionally greater. A rise in the chlorine content, which often accompanies advanced lactation, and an alteration in the chemical composition of the fat which sometimes occurs—giving an impression of rancidity—contribute to the unpleasant, salty, bitter, or rancid flavours frequently found in such milk.

Colostrum Milk.

The milk of newly-calved cows, known as colostrum, differs completely in colour, flavour, and composition from that obtained a week after calving. It is a viscous substance, with a sickly taste, and unfit for any dairy uses, while the cream separated from it is unsuitable for buttermaking—the fat is not identical with milk fat, and its taste is disagreeable. A comparison of the approximate composition of colostrum with that of milk shows its essential difference.

	Colostrum. Per cent.	Milk after 7 days. Per cent.
Fat	3·4	3·9
Sugar	2·5	5·1
Casein	4·8	2·5
Albumen / Globulin	15·8	·7
Ash	1·8	·7
Water	71·7	87·1

The large proportion of albumen and globulin causes coagulation to take place on heating colostrum. Seven days should be allowed before the milk is used for any purpose other than calf-feeding—the substances contained in colostrum being specially adapted for the needs of the new-born calf.

The practice of including colostrum milk or cream with the bulk supply results in a loss of quality and a grading down of the whole delivery.

Disinfectant Flavour.

The use of strong chemicals for disinfecting purposes in the milking shed or dairy often results in a tainting of the milk and cream. Carbolic compounds should always be avoided. Potassium permanganate and lime may be used safely in the cow-shed. For other dairy purposes—such as water treatment, and disinfecting tanks—chlorine compounds are effective in action. Care should be taken, however, to make certain that the strength of the disinfectant solution is correct—chlorine has enormous germicidal power (·5 parts per million of free chlorine is efficient in sterilizing water) and it is often used in far too great a concentration, when, besides being uneconomical, it is liable to produce a serious off-flavour.

Oily, Tallowy, or Sunlight Taint.

Certain metals, notably copper and iron, when absorbed by milk and cream, are the cause of chemical changes in the fat which give a taste described as "oily," "tallowy," or "cardboard." This taint develops rapidly in the presence of air and direct sunlight, and cannot be removed. Often, a cooler or pipe from which the tinning has worn

off, exposing a copper surface, will taint large amounts of milk, the taint developing after a longer or shorter time, according to conditions. In the same way, cream placed in rusty cans will take up considerable quantities of iron. In the warm state, milk and cream absorb metals more quickly, so that the retinning of worn utensils, especially cream cans which have become rusty, and coolers, should be done regularly. This is not a bacterial taint, and will develop in well-cooled and cold-stored milk and cream.

Other Absorbed Flavours.

Kerosene, petrol, smoke, engine exhaust fumes, paint, tar, and other strong-smelling substances produce taints in milk and cream, which readily absorb the odours from their immediate surroundings. Similarly, in the home, the flavour of other foods stored near milk, cream, or butter, such as fruit, onions, fish, &c., will be taken up by the milk fat in a very short time. Dairy products should, therefore, be stored well away from substances likely to impart a foreign flavour to them.

Control of Taints.

The control of most of these taints lies with the farmer, and on the care that he gives to his work depends the good quality of the finished dairy product. Bacterial off-flavours are only prevented by careful production methods and attention to cleanliness at all stages, and nothing can take the place of thorough washing, followed up by sterilization of all the equipment used.

It is important to remember that when once taints have become established in milk or cream on the farm, no subsequent treatment by the factory can be effective in removing them completely.

PREVENTION OF DISEASE IN PIGS.

By the general practice of hygiene and sanitation in the piggery, coupled with sound feeding methods, the incidence of most pig diseases can be considerably reduced.

The provision of roomy, well ventilated, but draught-proof sties is essential.

The floors should be swept clean every morning, all refuse being taken away and the yards raked over. Correct drainage of sties and yards will avoid the accumulation of water and help to keep down insanitary conditions.

Moisture is necessary for the free living stages of nearly all worm parasites and in its absence very few of them can survive for any length of time. Therefore, pig keepers who wish to avoid losses from worms must have dry, well-drained sties and yards.

Unhygienic and insanitary conditions are predisposing causes of rheumatism, catarrh, and some of the more serious bacterial infections, such as suppurative otitis and pneumonia. Piggeries should therefore be constructed on high ground: floors should be made of concrete and the run should be well sheltered from inclement weather.

Proper feeding is also essential for the maintenance of health in pigs. The food should be wholesome and must be supplied at regular intervals in proper quantities. Regularity in feeding induces better digestion. If the animals are properly fed, there is little likelihood of any food being left over. Stomach and bowel troubles, resulting from the ingestion of soured and fermented foods, are consequently minimised. Soiled food should be removed from the troughs and never mixed with fresh food.

Correct feeding and watering, together with adequate housing and paddocking, are undoubtedly most important factors in the preservation of the health of the pig.

—*E. R. Hollamby.*

The Role of Legumes in Rejuvenating Old Soils.*

H. W. KERR.

IN his speech delivered when opening the Cairns Conference of the Queensland Society of Sugar Cane Technologists, the Minister for Agriculture and Stock (Hon. F. W. Bulcock) made special reference to the need for developing some means of restoring lands on the tropical Queensland coastal plain to a higher plane of fertility without direct recourse to the costly method of applying artificial manures. The Minister alluded to the growing of some form of legume, or possibly mixed pasture with legumes, which would serve to build up the humus and nitrogen content of the land, while also providing a pasture of superior quality to that which customarily occupies such lands.

This recommendation should not be turned lightly aside: indeed the policy outlined is fundamental to any project of soil rejuvenation. It is well known to agriculturists that legumes possess the interesting property of enriching the nitrogen content of the soil in which they are grown and ploughed under, by virture of the co-operative effort which is accomplished between the host plant and the bacteria which live in the nodules to which they give rise, on the roots of their host. Legumes commonly employed for this specific purpose in the Queensland cane areas are Poona pea, black cowpea, and Mauritius bean; but there is a long series of leguminous species not so well-known to Queensland farmers but which find considerable favour in other States of the Commonwealth, and in countries overseas. As with other plant species, certain of these are better adapted than others for growth in any particular environment, and extensive experimentation is necessary to enable the most suitable legumes to be selected for a given set of conditions.

On the Queensland coastal lands which are devoted to cane production the particular conditions which are likely to be governing factors in this regard are (*a*) temperature, (*b*) soil acidity, and (*c*) general plant-food and soil moisture deficiencies. Vetches, for example, are generally restricted to the cooler regions, though they may prove successful as a winter crop in the tropics. Lucerne is generally regarded as a legume which likes a soil rich in lime, and with an absence of any marked degree of acidity; Poona pea, on the other hand, is not so sensitive to a moderate degree of soil acidity, though it does benefit of course from a dressing of lime applied to the soil before seeding. Poona pea will also withstand soil moisture deficiencies without undue distress, and yield satisfactory crops even where the general level of fertility of the soil is low.

In all probability there exist other leguminous species which could be tried to advantage under our conditions, and the Bureau has from time to time received supplies of seed of imported legumes for test purposes. A few years ago it was found for example that one of the "rattle-pod" family, known as *Crotolaria goreensis*, was a specially prolific cropper under the dry conditions of Southern Queensland; but its propagation was not encouraged in cane areas due to the danger of

* Reprinted from *The Cane Growers' Quarterly Bulletin* (Bureau of Sugar Experiment Stations), July, 1937.

its becoming a noxious weed. It produced seed very freely and our experience suggested that it would be objectionable for short fallowing. However, where a long fallow legume is desired, it offers distinct possibilities, though careful study of its grazing value would be necessary, as certain of the *Crotolaria* are poisonous to stock. This particular legume is receiving considerable attention from the pine-apple industry, where it is an important factor in arresting soil erosion on hillside slopes. It is planted in the interspace between the rows of pines and cut when in full growth.

There is another important feature of legume culture which has been appreciated only in relatively recent years. Though the standard species employed in any area may be grown without difficulty, a new legume may be virtually a failure when first planted, whereas subsequent crops on the same land may be quite successful. An interesting example of this phenomenon is the early attempt to grow lucerne (or "alfalfa" as it is called) in the United States of America. When lucerne was first introduced to certain parts of the country, it was a rank failure, for no apparent cause. Careful study showed that this was due to the absence of nodules on the roots of the plants, suggesting that the particular organisms responsible for their development were absent from the land. Inoculation of the land with soil from a field in which lucerne could be grown successfully was found to overcome the difficulty, while similar results could be accomplished by employing a laboratory culture prepared with organisms which had been expressed from nodules, and sprinkled over the seed before planting. So highly beneficial has this treatment proved that it has now become a standard farming practice in that country.

It is found, therefore, that the existence in the soil of the organism capable of effecting nodulation with, for example, lucerne, does not ensure success with all other species. On the contrary it has been shown that legumes may be classified in distinct groups, such that one strain of the root-nodule organism will serve most effectively all members of that group, but it is less effective or even quite ineffective with members of other groups. There are many known strains of organisms within the "cowpea group" alone, while at least a dozen cross-inoculation groups of organisms are recognised. It then becomes the problem of the soil bacteriologist to assure himself that the particular strain of the organism is present before the agriculturist attempts to test the value of new legumes in any field. In order to make sure he must culture the desired strain and inoculate the seed with this culture before seeding the field.

So important is this problem that the pathological branch of the Bureau has recently embarked on a full study of the question in connection with the importation of the new legume species which are being tested in the Queensland cane areas. At the present time a wide range of strains are being cultured in the laboratory, and the value of inoculation is also being tested with plantings of even the standard legume species when they are planted for the first time in canelands which have grown only other types of legume. The object of the work is threefold—firstly, to determine the possibility of improving the growth of legumes now grown for green manurial purposes; secondly, to acquire, if possible, more suitable species for this purpose; and thirdly, to explore the possibility of propagating legumes which have also a commercial value, as a means of providing alternative crops for excess sugar cane.

At the present time the growth of lupins in the Southern areas, of lucerne in the central and far northern coastal district, and trial areas of Berseem clover, wild white clover, lespedeza, and several soybean varieties are also planned. Seeds of these species, together with their special bacterial cultures, have been collected from other states of the Commonwealth and from overseas. They will therefore be subjected to careful and thorough trial, and canegrowers should be interested in the outcome of these efforts.

Of particular interest is, perhaps, the soybean, as it has become a crop of high potentialities commercially in the United States of America in recent times. The soybean is indeed one of the oldest cultivated crops. It is described in ancient Chinese literature of nearly 5,000 years ago. and in its value and variety of uses it is still the outstanding legume grown in China and Japan. It is only during the last twenty-five years that the culture of the crop has assumed any importance outside Asia; by 1924, over 5 million bushels of grain were harvested annually in the United States, while in 1935, that country produced a yield of almost 40 million bushels of beans.

The soybean is grown as a summer leguminous annual. The pods are from 1 to 2½ inches long, and contain from 2 to 4 seeds. Stems, leaves and seed pods are covered with short reddish-brown or grey hairs. The root nodules are large and abundant. The stems are branched, and grow from 2 to 3½ feet or more in height. It is grown over a wide range of conditions, from the semi-tropical to the temperate regions. With the exception of cowpea and lespedeza, it is more acid tolerant than any other legume crop grown in the American corn belt, but it will, of course, respond well to soil treatment. The beans need a well-prepared seed bed, in order to give them a good start ahead of the weeds. The seed is harvested by the use of the combine, which threshes out the beans and leaves the straw on the land, to be turned under to enrich the soil. The average yield for 1935 in the State of Illinois was 18 bushels per acre.

The beans have a high feed value, their average composition being as follows:—

	%
Moisture	10
Protein	36
Fat	17
Carbohydrates, etc.	27

They thus differ markedly from other legumes which are usually very much lower in both protein and fat.

The oil which is expressed from the beans may be utilized in the preparation of edible fats, or soaps, while its "drying" properties render it of value in the paint and varnish industry. The meal which remains after the oil is expressed is a valuable concentrate which finds extensive use as a stockfeed.

One of the most recent industrial developments is the utilization of meal as raw material in the preparation of "plastics," which now find wide application in the manufacture of a variety of articles in everyday use. A waterproof-glue for plywoods may also be made from soybean meal, and this product is now in great demand where high tensile strength is demanded. Lastly, the meal is a valuable fertilizer material, due to its high nitrogen content.

These brief notes should indicate the possibilities of this interesting crop. Certain varieties have been grown in trial plots in the neighbourhood of Brisbane in recent years, and some attempt has been made to grow them in the cane areas. So far, the results of the latter trials have been disappointing, and it is our purpose to seek the cause of this failure. Possibly the researches now being undertaken by our pathology staff will indicate the difficulty. Reports show that the crop can be grown in the Philippine Islands, and it would therefore not appear to be due to our high tropical temperatures and humidity. Perhaps it is a question of discovering the correct variety for our particular conditions.

PRUNING DECIDUOUS FRUIT TREES.

The pruning of deciduous fruit trees should be done as well as it is possible for the operator to do it.

To make a good job of pruning, good, clean, sharp tools are very necessary. Pruners will find it useful to provide themselves with a light box—fitted with a strap to make carrying easy—for holding secateurs, pruning saw, sharp pruning knife, oil-stone, oil-can, pot of coal tar, a brush and a bottle of disinfectant.

A good pair of secateurs is necessary, and they must be kept sharp and smooth. Every pruning cut causes a wound, but wounds of smaller diameter soon callus over provided the secateurs are sharp and clean. However, many pruners try to cut some of the larger limbs with their secateurs, and thus strain both the secateurs and their own wrists, while generally hacking the limb off and leaving rough edges which facilitate the entry of insect pests and fungous diseases. All large cuts should therefore be made with a saw, which, like the secateurs, should be both sharp and clean.

A sharp pruning knife is necessary for trimming the rough edges left by the saw, for, if they are not pared, callus formation is slow and the wound may not heal.

The need for an oil-stone and oil is obvious. A rub of the secateur blades on the oil-stone now and again keeps them keen and sharp, and makes the work much easier.

Pruners should always have with them a pot of coal tar, for tar is a disinfectant as well as a wood preservative, and, being pliable, makes a good surface covering. After pruning one tree and before going on the next, it is advantageous to paint all large cuts over with coal tar. The operation takes only a couple of minutes, and will help the tree considerably.

Both secateurs and saw often require disinfecting, for many diseases can be transferred from tree to tree by these implements. A strong solution of either formalin or corrosive sublimate rubbed over the blade with a rag will reduce any risk.

The foregoing suggestions are not trivial, as fruit trees on which a man depends for his living and which he expects to keep him for many years deserve the best treatment possible in regard to pruning as well as to cultivation and manuring.

H. St. J. Pratt.

An Attractive Pisé Dwelling.

A. E. GIBSON.*

THE merits of adobe or pisé structures, particularly where, for transport or other reasons, wood, brick, or concrete forms of construction are more or less impracticable, have been discussed previously in this Journal.†

Quite recently the construction of an attractive pisé dwelling and farm outbuildings at Woodridge by Mr. S. D. Galletly was under the notice of the Department of Agriculture and Stock.

Some two years ago Mr. Galletly conceived the idea of utilising pisé for the construction of a homestead and submitted samples of soil from his property to the Department for mechanical analysis. These tests proving satisfactory, he commenced building operations and gained valuable experience during their progress. To-day Mr. Galletly is the proud possessor of what is undoubtedly an attractive homestead, delightfully cool in summer and warm and cosy in the cold winter weather; and he has demonstrated successfully what can be done by an energetic man from materials close at hand.

The timber used in the building of the house was milled from hardwood timber grown on the property. Mr. Galletly has courteously supplied a ground plan of his house, together with a list of materials and details of the sizes of timber used; and these are submitted with the idea that they may be of guidance to those who are contemplating the erection of a house but to whom the idea of pisé construction has not previously occurred.

MATERIAL REQUIRED FOR COTTAGE AS DESIGNED.

WALLS, 10 FT. HIGH.

Main Building.

Doors and window frames.—22/10 ft.—8 in. x 2 in.
Top plate.—100 lineal ft.—4 in. x 2 in.
Ceiling joists.—11/16 ft.—3 in. x 2 in.
Rafters.—21/9 ft.—3 in. x 2 in.
Purlins.—200 lineal ft.—3 in. x 1½ in.
Ridge pole.—34 lineal ft.—6 in. x 1 in.
Gable studs.—50 lineal ft.—3 in. x 2 in.
Ceiling.—800 super. feet.
Iron.—34 sheets—9 ft.
4 doors, 2 casements—6 ft. x 1 ft. 6 in.; 2—4 ft. x 3 ft.; 1—4 ft. x 4 ft.

---

* Late Director of Agriculture.
† Q.A.J., Vol. xxxvi., July, 1931.

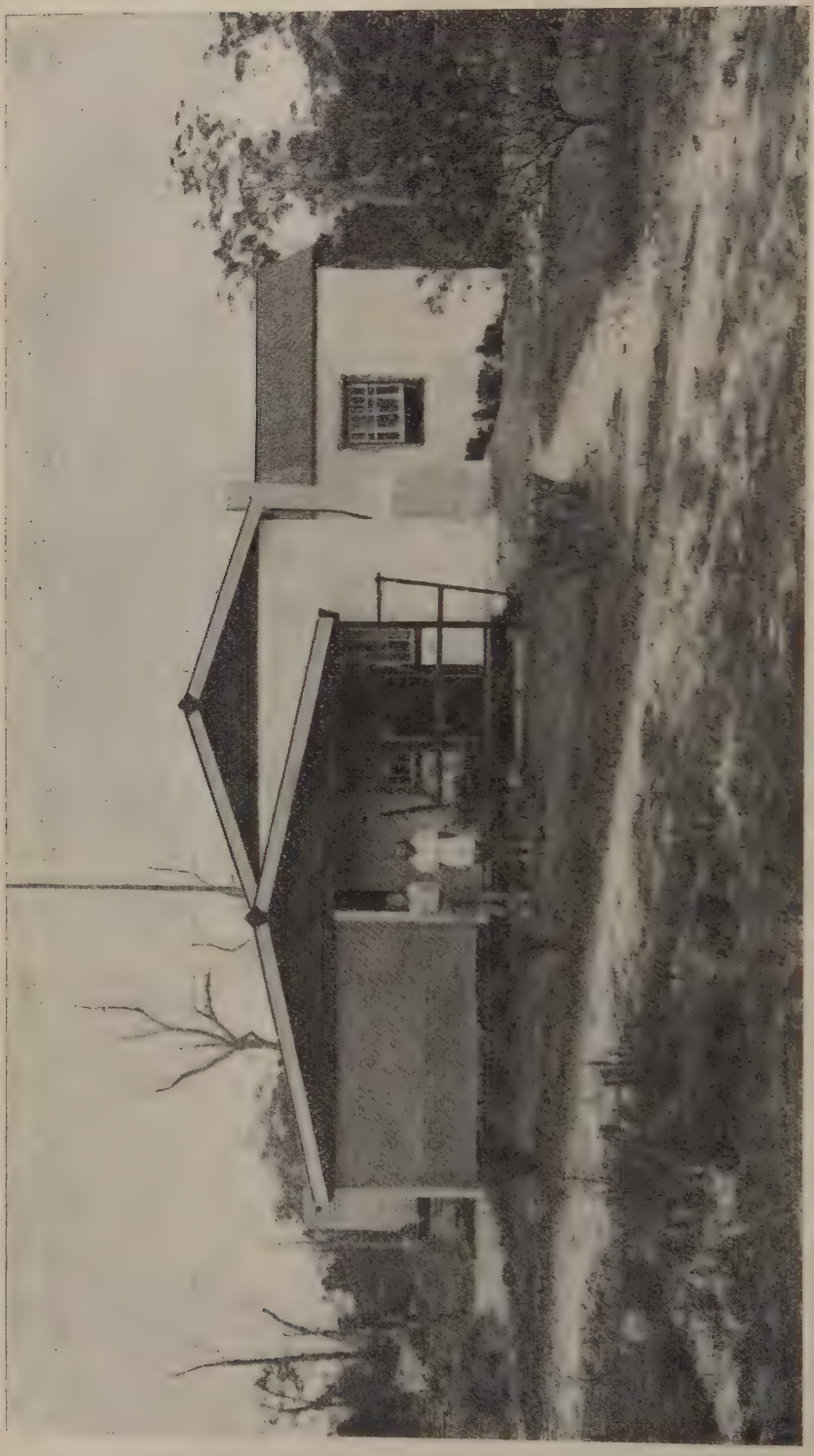


Plate 46.

An Example of Pise Construction.—A farm homestead designed and built by Mr. Stewart Galletly.

Side Gable Room.

Ground plate.—3/12 ft.—4 in. x 3 in.
Floor joists.—5/12 ft.—4 in. x 2 in.
Flooring.—175 super. ft. hardwood.
Ceiling joists.—5/12 ft.—3 in. x 2 in.
Rafters.—10/8 ft.—3 in. x 2 in.
Purlins.—80 lineal ft.—3 in. x 1½ in.
Ridge pole.—1/20 ft.—6 in. x 1 in.
Weatherboards.—36 super. feet.
Ceiling.—8 sheets three-ply, 100 lineal ft. cover strips.
Iron.—30 sheets—9 ft.

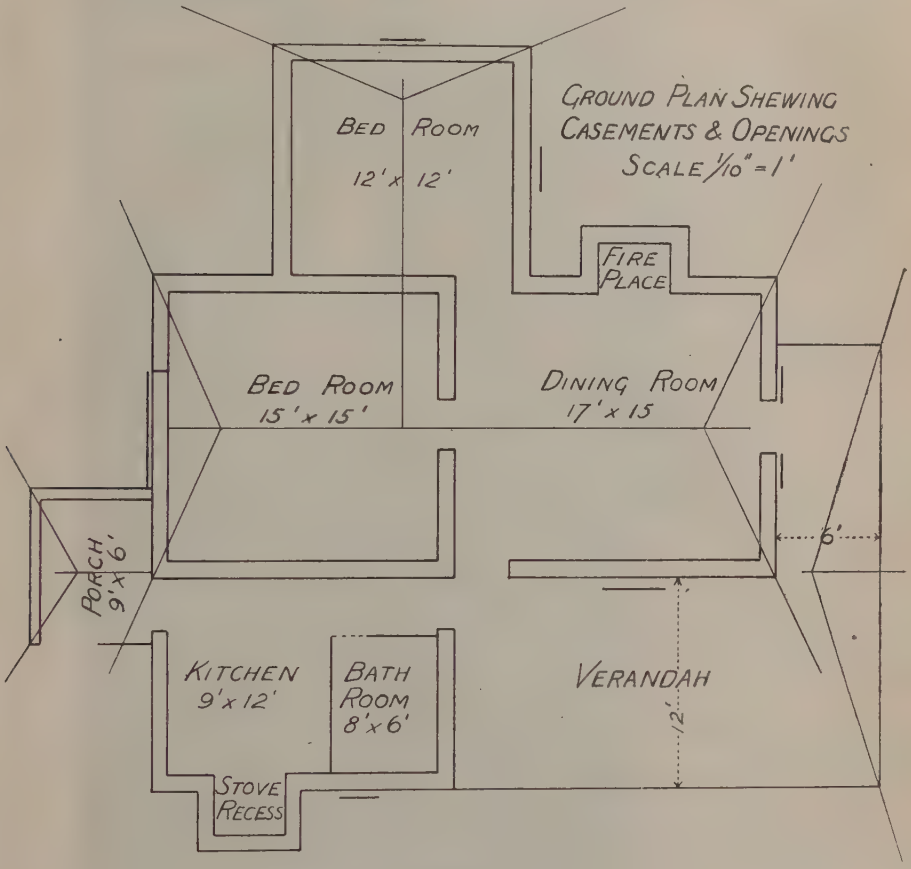


Plate 47.

Veranda, Kitchen, and Bathroom.

Ground plates.—3/24 ft., 3/6 ft.—4 in. x 3 in.
Floor joists—10/12 ft.—4 in. x 2 in.
Flooring.—400 super. ft. hardwood, shot edges.
Veranda posts.—6/8 ft.—4 in. x 4 in.
Veranda plate.—1/64 ft. lineal—6 in. x 2 in.
Rafters.—18/12 ft. 6 in.—3 in. x 2 in.

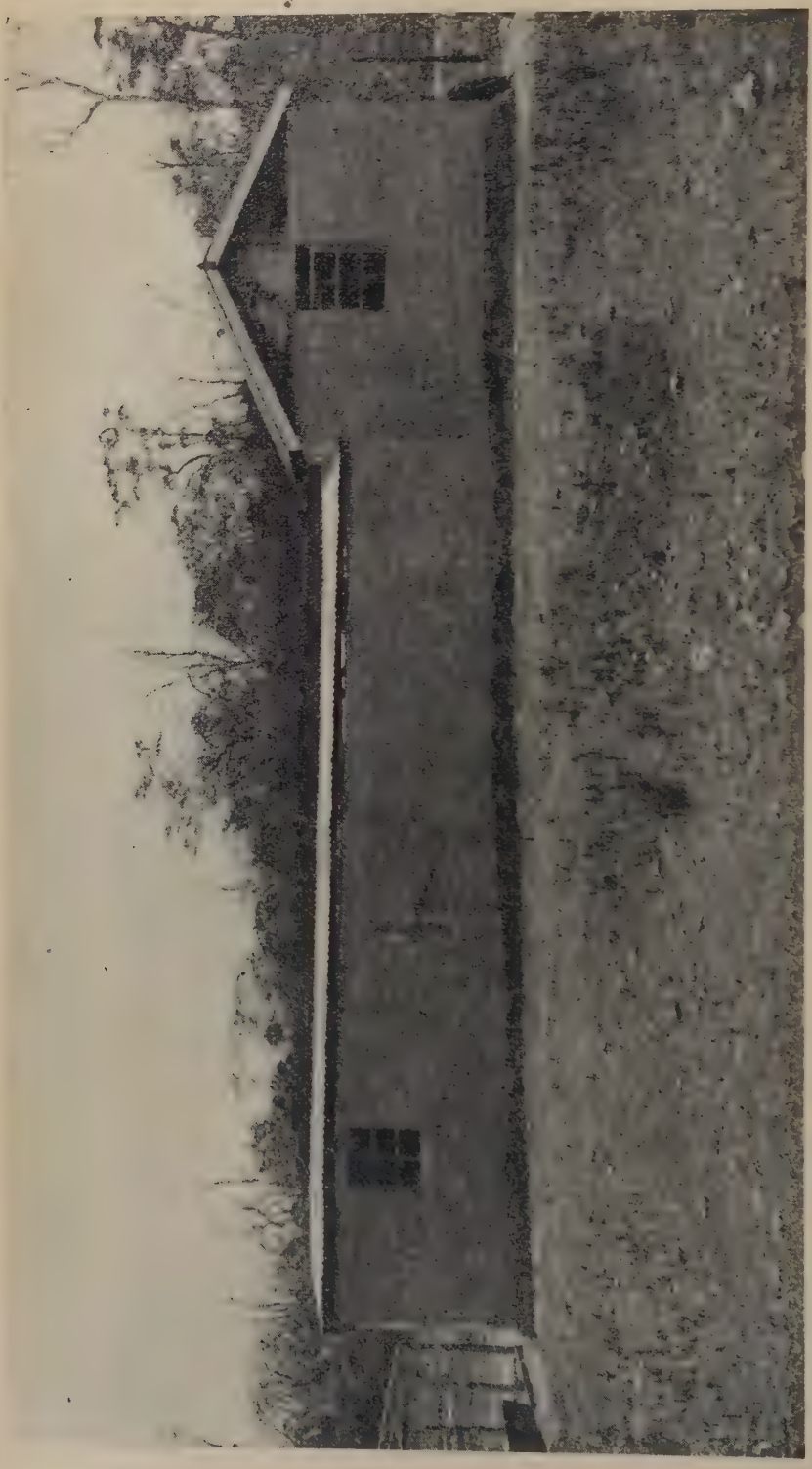


Plate 48.
Farm buildings of Pisé on Mr. Stewart Galletly's property near Woodridge.

Pole plate.—1/42 ft.—3 in. x 2 in.
Purlins.—250 lineal ft.—3 in. x 1½ in.
Gable studs.—25 lineal ft.—3 in. x 2 in.
Weatherboards.—75 super. ft.
Partition.—8 sheets three-ply.
3 doors, 2 windows.
Iron.—50 sheets—6 ft.
Flashing.—42 ft.

20 lengths of spouting.
10 lengths ridgecapping.
2 tons cement.
1 roll ruberoid.
Nails, paint, paper, &c., not shown.

CITRUS TREES AND THEIR FOOD REQUIREMENTS.

A citrus tree does not grow at a uniform rate, but makes three or more growths of shoots and leaves each year. The times when these growths occur, and the degree of their development, may vary with local conditions, the availability of plant foods and methods of tillage and irrigation.

In the spring, shortly before blossoming, the heaviest growth occurs, and from this stage, particularly until the approach of the wet season, the soil should be maintained in good cultural condition to enable the trees to obtain the essential plant foods by means of a healthy, vigorous root system. There is a smaller and irregular growth of twigs and leaves about midsummer, and a third growth in the autumn.

In the trunk and main branches dissolved mineral matter taken from the soil by the roots passes upwards to the leaves, and elaborated plant foods pass downwards from the leaves to the roots. Citrus trees in healthy condition do not shed their leaves before the new ones have become at least partially developed; therefore, the heaviest leaf fall usually takes place after the spring growth.

Careful tillage and drainage, although absolutely necessary for successful fruit growing, are not, however, sufficient to maintain the fertility of the land from year to year without the aid of organic manures or fertilizers. Growers from practical experience have learned the truth of this statement. Owing to the difficulty of procuring sufficient quantities of organic manure, mineral fertilizers are applied which supply nitrogen, phosphoric acid, and potash to the soil, each constituent being necessary for the production of good fruit and the maintenance of healthy trees.

Certain points relative to the effects that these constituents are likely to have on the development of the trees, and on the production of the orchard, are worth considering, in order that growers may be able to decide as to their own particular requirements.

The effects of a generous supply of nitrogen are much more apparent than those of either phosphoric acid or potash. Nitrogen stimulates vegetative growth and large applications of it will increase the amount of rag and the thickness of the rind of the fruit. Insufficient nitrogen, however, is indicated by yellowish-coloured leaves, and the trees generally have a stunted appearance.

Unless adequate phosphoric acid is available the fruit does not develop normally. Phosphatic manures promote root development, and heavy applications hasten the maturity of the fruit.

Large quantities of potash will cause the rind of the fruit to be much thinner, and have a marked influence in improving the keeping and carrying qualities of the fruit. Potash also increases the vigour of the tree, and intensifies its resistance to adverse conditions.

These facts show that these three plant foods must be judiciously balanced to meet the requirements of the trees.

—*H. Collard.*

Sunspots and Climate.

H. I. JENSEN, D.Sc.*

IN a scientific paper published in 1904, the writer drew attention to the correlation between sunspot minima and protracted droughts in Australia. Thus 1811, 1822, 1833, 1844-46, 1855, 1864-69, 1877, 1888-89, 1900 to 1902, 1912, 1923-24, and 1934-36 have been periods of drought, and the most disastrous of these were in the "Great minima" of 1833, 1864-67, 1900-1902, 1934-36.

It is noticeable that all the droughts of a protracted and widespread nature came in periods of sunspot minimum, approximately at an eleven years interval, and the worst in the periods of Brückner minima, at an approximately thirty-five years interval.

The idea of such a relationship existing between climate and sunspots was by no means new. Dr. Brückner and Dr. Julius Hann, notable German-Austrian meteorologists, had many years earlier noticed the same facts in regard to European climate.

Sir Norman Lockyer, the great British astronomer, was a protagonist of the close inter-relationship of sunspot and weather cycles, and Alexander McDowall, a Scottish scientist, had demonstrated that the time of the flowering of plants was affected by the sunspot cycle.

Jevons, the English economist, had many years earlier shown that the world's prices of wheat fluctuated with the sunspot cycle, and that Indian famines coincided with years of sunspot minima.

During the past forty years great droughts have commenced and ended earlier in the Northern hemisphere than in the Southern. The drought of 1900-1902 affected Argentine, Egypt, India, Europe, and Siberia, as well as Australia, but commenced and ended earlier in Europe than in Australia. The drought of 1922-23 in Russia and Siberia affected Australia in 1923-24, and the last great drought has been playing havoc in Europe and America for several years.

In spite of the fact that this periodicity or cyclical recurrence of great droughts is so well known, American and international wheat speculators do not ignore well-known and well-established facts about the connection between sunspots and wheat prices.

Our producers' organisations, on the other hand, apparently disregard these facts. Thus it is reported that almost the whole 47,000,000 bushels of the New South Wales 1935 wheat-crop were exported early in 1936 and a large portion of the 1936 crop was sold in advance at a loss of 1s. 6d. to 2s. per bushel on the world price for 1936. Thus the farmers of New South Wales lost at least £3,000,000 by not having an organisation capable of anticipating price fluctuations, and wheat speculators benefited to that extent. Millions of head of cattle and sheep have been lost through drought which could and should have been saved.

The present writer wrote several articles on this subject in 1922 and 1923. In one of these ("Daily Mail," Brisbane, 6th January, 1923) he remarked: "There seems to be little hope of science ever being able

* Formerly Government Geologist, Northern Territory, and of the Department of Mines, Queensland.

to achieve exact seasonal forecasts for small districts. The best that astronomy can yield is a general continental forecast, giving indication of the class of season to expect. This, however, should be of great aid to agriculturists and pastoralists.

"Owing to the mobility of the atmosphere, small causes often produced by the action of man, such as a bushfire, the clearing of virgin scrub, or similar occurrences, frequently cause an abnormal season for the environment." The position is still the same although, during the last few years, South African meteorologists have found that moderately correct forecasts for individual districts can be made, other things being equal, by studying past rainfall records in relation to sunspot minima and maxima.

There is a tendency for the same type of season to recur in the same district at the same approximate period from each maximum and minimum. If it could be proved that the same tendency held good for Australia it would be very helpful.

In the same article reference was made to experiments in rain-making, and the fact was emphasised that the necessary condition for rain-making artificially is that moisture-laden clouds must be present, and that up to the time of writing no rain-making experiments had been successful. In another article in the "Daily Mail" (December, 1926) the writer suggested the use of aeroplanes to shoot dust into the clouds for the purpose of forming condensation nuclei.

During the last couple of years this method has been successfully tried in Europe; but in all rain-making the first essential is favourable conditions, and they do not often exist in sunspot minima.

In another article in the "Western Star" (23rd March, 1928) the writer said: "We may expect good years from 1928 to 1932 and then a gradual desiccation culminating in a record drought from 1934 to 1937."

In various statements to the North Queensland press in 1934 the writer again gave a warning that the increasing frequency of earthquakes and volcanic eruptions in other parts of the world were a portent that a fresh drought was commencing, and he said that a serious drought was to be expected in 1935 and 1936.

It was pointed out in these articles that there was yet time to make provision for stock, and to perfect organisations for the marketing of produce both to protect the Australian farmers against exploitation at the hands of speculators, and the Australian pastoralists against excessive prices for feed for starving stock.

Unfortunately nature's warnings have been ignored, and few, if any, of Australia's stockowners have made any provision against drought in the past. It now avails little to discuss what might have been done; but it is to be hoped that professors of agriculture, scientists guiding the pastoral industry, and the great farmers' and pastoralists' organisations will set a little time aside between now and the next anticipated droughts (1946-47 and 1957-58) to go into ways and means of reducing drought losses to a minimum. It is also to be hoped that national policy will include the provision of substantial sums for the making of dams and irrigation channels, silo construction for the conservation of native fodder grasses, and similar undertakings.

Judging Pork and Bacon Carcases.

IN an article appearing in the "Pig Breeders' Annual" for 1936-37 details are disclosed of a standard method of valuing porker and baconer carcases supplied to the British market which, it is believed, will be welcomed heartily by men prominent in the pig industry in Australia. This method has been arrived at through the collaboration of Mr. H. R. Davidson, M.A. (Cantab.), Dip. Agric., late School of Agriculture, Cambridge, and Rowett Research Institute, Aberdeen; John Hammond, M.A., D.Sc., F.R.S., School of Agriculture, Cambridge University; and Jos. B. Swain and Nevill L. Wright, F.I.C., D.I.C., Scientific Liaison Officer, New Zealand Government.

In reviewing the article, Mr. L. A. Downey, H.D.A., Instructor in Pig Raising, says all will agree that the consumer is the judge who counts really in deciding the quality of pork and pork products, and it is necessary therefore to base any system of pig-judging on a knowledge of the consumer's requirements.

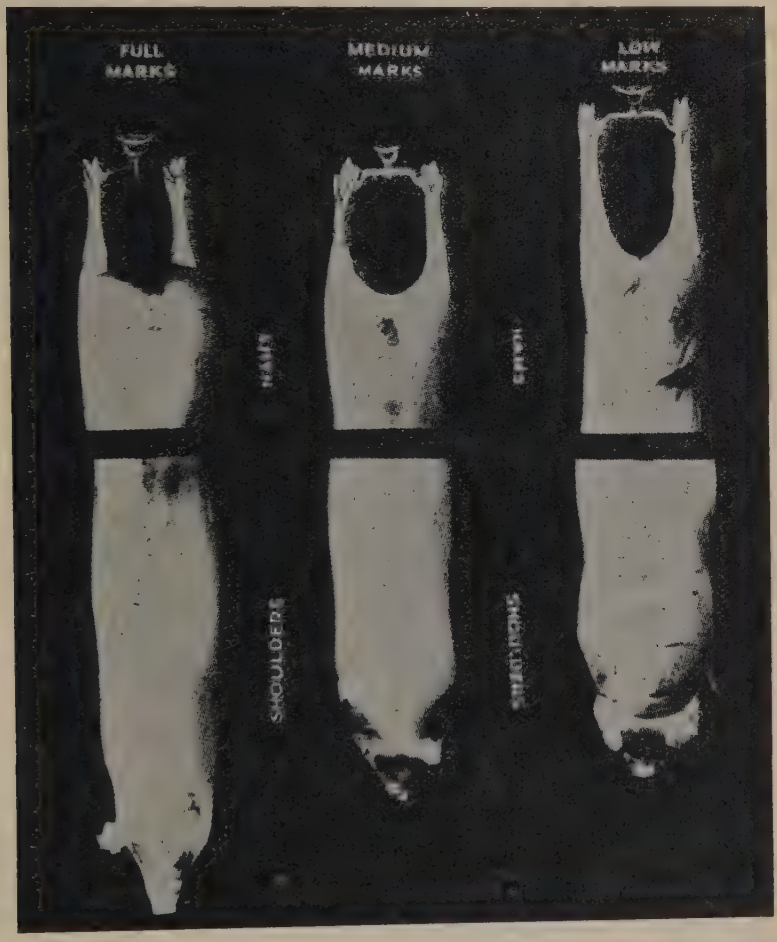
When judging breeding pigs, the good judge keeps well in mind trade and consumer requirements, and balances these features with constitution and breeding ability, characteristics which are of such importance to farmers.

In judging porkers and baconers alive, the judge endeavours to anticipate how the pigs will appear in carcase form and how closely their carcases will conform to his idea of trade requirements. In such a task he must do some guess-work. The judging of carcases is far more reliable than live pig judging, for one can see actually what lies under the coat when the pig is dressed and opened up. Even carcase-judging may not be altogether reliable, because, if the carcases are judged on appearance only, and compared with the ideal in the judge's mind, that factor of individual opinion, which is very variable, will play always a big part in the making of decisions.

British and Australian Standards.

The authors, says Mr. Downey, offer their method for the guidance of those supplying frozen porkers and baconers to the British market, for use in judging competitions, and for individual farmers to check up on the carcase quality of their pigs. Although prepared for pigs supplied to the British market, the standard for judging is found to agree very closely with the requirements of the Australian domestic trade.

JUDGING BY EYE APPRAISAL.
STANDARDS FOR AWARD OF MARKS.



[*Produced for New Zealand Evaluation Committee by Jos. B. Swain.*

Plate 49.

Careful consideration has been given by the authors to consumers' requirements in arriving at the proportion of the total marks to be allotted for each feature of the carcase, and in determining the most desirable measurements for the various parts of carcases of given weight classifications. Such a sense of proportion is shown by the valuation of carcases that, when one has valued a carcase according to this method, he has a feeling of complete satisfaction that the results must be correct. Such a balance of values is very difficult to obtain by

a mere visual inspection of the carcase as a whole, as has been practised previously in carcase competitions.

With the object of providing a standard system which can be used by almost anyone (not necessarily an expert) and which is not influenced by the personal opinion of the judge, the authors have, in their own words, "whenever possible, tried to obtain a *measurement* to express the point, rather than to rely on visual judgment, into which the personal element enters. As regards three points, however (hams, shoulders, and streaks), we have not yet been able to arrive at a satisfactory measurement. For the streak, several methods have been tried and discarded as imperfect. Further work on these points is required before judgment by measurement is applied. Therefore, for the judgment of hams, shoulders, and streaks by the visual method, we have constructed photographic standards covering the allotted range of marks, so that the personal element can be reduced to a minimum."

The Scale of Points.

The scale of points is divided under the headings of marketing points and breeders' points, the latter being subdivided into points by inspection and points by measurement.

The standard of marking suggested is very severe and only good carcases will obtain more than 50 per cent. of the total. There is room, however, for a really excellent carcase to get close to 100 per cent.

	Marks.	
	Porkers.	Baconers.
(1) Marketing points—		
Colour—clean, fresh, white	5	5
Skin—smooth and fine	5	
Dressing—freedom from bruises and hair	5	5
	15	10
(2) Breeders' points—		
(*a*) By inspection:		
Hams—well-filled and fine-boned	8	8
Shoulders—light	7	7
Streak—thick, full of lean meat	12	12
(*b*) By measurement:		
"Eye muscle" of loin, thick	28	28
Backfat thickness, correct proportion	20	20
Body length in proportion to weight	20	20
Leg length—short	5	5
	100	100
(3) Suitability of carcase weight		15
Total Marks	115	125

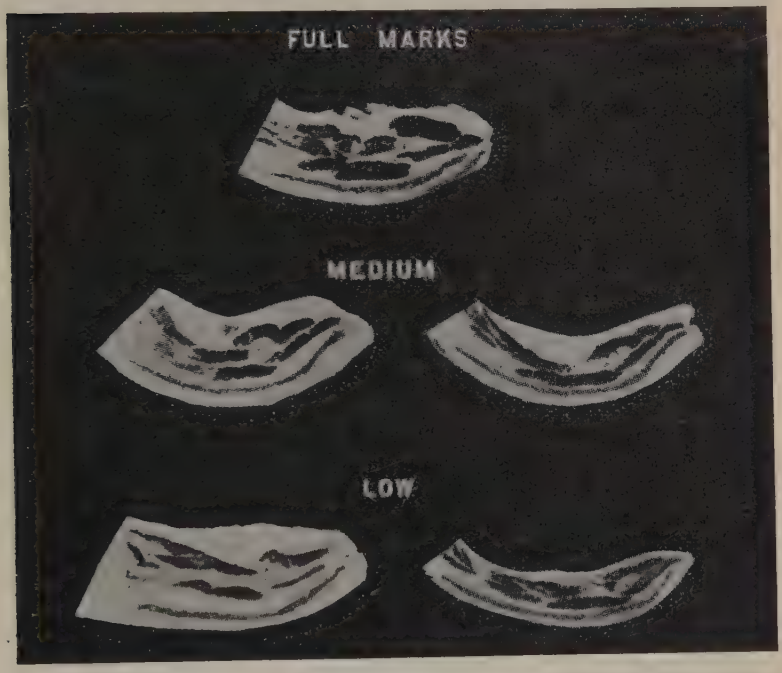
With regard to porkers, the article states: "The weights of carcases most in demand for the London trade are from 60 to 80 lb., although during the summer months, and in some other markets, there is some demand for heavier carcases for cutting purposes. The latter conveniently fall into two main groups—80 to 100 lb. and 100 to 120 lb. Since the main trend of future trade, in analogy with "Canterbury

lamb,'' will probably be with the 60 to 80 lb. group, it is on this group that we have concentrated most. Scales, however, have been prepared for the other groups as well.''

With baconers, the standard adopted was a Class I. carcase for the Wiltshire bacon trade under the British grading specifications, and as a guide to overseas producers the authors suggest a carcase weight range of 135 to 154 lb. as being most desirable, and where a guide is wanted the 15 points are included in the scale of points.

STANDARDS FOR AWARD OF MARKS.
BY EYE APPRAISAL.

Streak (Baconer).



[*Produced for New Zealand Evaluation Committee by Jos. B. Swain.*
Plate 50.

Method of Procedure.

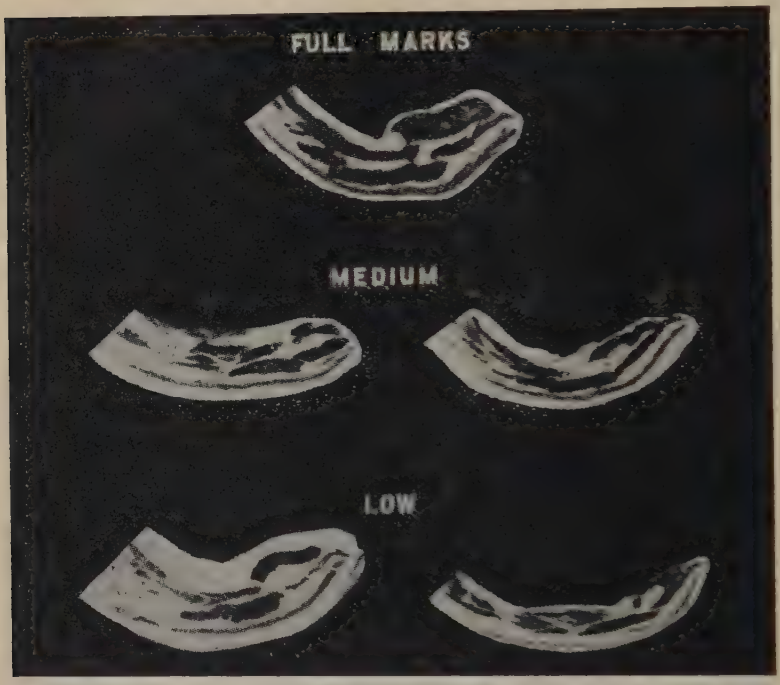
Having ascertained the weights of carcases, the judge views them from behind and values each carcase on the marketing points as shown in the scale of points, and on the hams and shoulders, using as a standard the photographs as shown in plate 47 the suggested marking being the possible 8 points for the best hams, 4 points for the medium hams, and 1 point for the worst hams in the illustration, and, of course, varying points in between these according to the relative value of the hams. The shoulders are valued in comparison with the photographic standard, in which the best shoulders are valued at 7 points, the worst at 1 point, and the intermediate shoulders at 4 points: the judge then uses his discretion regarding shoulders falling between those illustrated.

The carcases are sawn down the centre line into two sides, and the length of body and length of leg are taken from the points shown in plate 48, using a tape measure graduated in millimetres. As the length of body and shortness of leg are valued in proportion to the

carcase weight, tables have been prepared indicating the most desirable measurements for pigs of any particular weight range, and by reference to these tables, according to the weight of the carcase and its measurements, the judge can read off the number of points gained by each carcase for these features.

STANDARDS FOR AWARD OF MARKS.
BY EYE APPRAISAL.

Streak (Porker).



[*Produced for New Zealand Evaluation Committee by Jos. B. Swain.*

Plate 51.

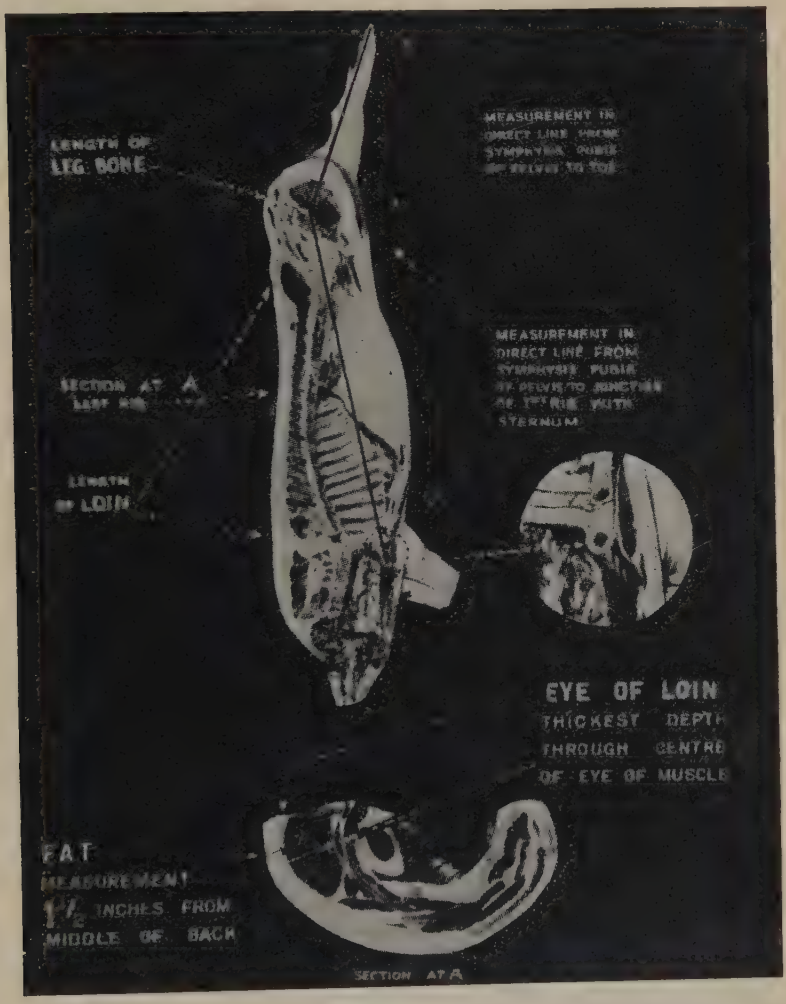
One side of the carcase is then cut through level with the last rib, and from the cut surface of the hind part of the side, further valuations are made. The streak is compared with the photographic standard (see plates 49 and 50) and marked according to the standard—namely, 12 points for best, 1 point for the worst, and 6 points for the medium streaks, as illustrated. The streak should be thick and fleshy, and in porkers there should be a greater proportion of lean to fat than is required in baconers.

The eye muscle and back fat are then measured by callipers at the positions shown in plate 48, excepting that on porkers the backfat measurement is taken 1 inch from the middle line, whereas on baconers it is taken 1½ inches from the middle line. These measurements are then referred to tables provided, to give their respective value in accordance with the weight of the carcase.

The award sheet on a carcase gives the breeder a lead towards determining the cause of any defect in his pig carcases. For example, a badly shaped ham or shoulder is obviously a fault in the conformation

of breeding stock, and a thin streak may be due to inherited faulty conformation or to giving the pigs too much bulky food or excessive liquid. An under-developed eye muscle is probably inherited to some extent, but it may also be due to faulty feeding, such as a deficiency of protein when the pig is in its early growth stage, about weaning time.

JUDGING BY AWARD OF MARKS FROM MEASUREMENT.



[*Produced for New Zealand Evaluation Committee by Jos. B. Swain.*

Plate 52.

Too little or too much backfat may be due to faulty feeding, but mostly it indicates that the pig had either not reached, or had passed, that stage of maturity at which it would have given a good carcase. A porker type pig slaughtered at bacon weight can usually be expected to give an over-fat carcase.

Length of body is certainly inherited, but it is possibly influenced by feeding and management to a limited extent. Pigs vary in the number of ribs they possess, and this materially affects their length

of body. When a carcase is too long in the leg it is due either to inheritance or to having been slaughtered before it was sufficiently matured.

It will be gathered that the system of judging is most exacting, but it can be of immense value to the careful pig breeder who desires definite information on which to base his work.

Already some preliminary judging by these methods has been carried out in Queensland, and the carcases of the export bacon pigs at the 1937 Royal National Show held in Brisbane will be judged on the new scheme of marking.

PREPARATION OF LAND FOR MAIZE.

To get the best results maize requires a good soil, in which a plentiful supply of plant food is available, a condition which can only be brought about by an early and thorough preparation of the land before planting, attention to the cultivation of the crop itself, and to the eradication of young weeds during its early growth.

The land should be ploughed to a depth of at least nine inches during the winter and allowed to lie in the rough until the early spring. The action of the frost and the rain will improve the texture of the soil and will leave it in a mellow condition. In the early spring the land should receive a second ploughing, —if possible, a cross ploughing. This should not be so deep as the first ploughing, and should be immediately followed by a harrowing and cross harrowing to work the surface soil into a fine tilth.

If a crop of weeds is turned under during the second ploughing, planting should not be carried out for at least a few weeks to allow decomposition to take place. On land which is not too heavy and moist, rolling is desirable, as it consolidates the soil and helps to make a good firm seedbed. Rolling should always be followed by a light harrowing.

Preparation of Seedbeds.—The preparation of the seedbed is one of the most important points in the production of maize and no amount of after cultivation will undo the damage caused by planting in a badly prepared piece of land.

One has only to see the difference, not only in the growth but in the colour of the foliage also, between a crop grown on thoroughly prepared and another on hastily prepared land, to realise how great the effect is.

Give the young crop a chance to become well established in a well-prepared seedbed—in which the young plants will not have to battle with a host of weeds—and the increased return will more than compensate for the extra time and labour spent.

Time to plant.—The best time to plant will naturally vary in different districts. In districts which have a long growing season and a comparatively regular rainfall, planting can be carried out whenever weather conditions are suitable, from August to late December.

Two very important points are—firstly, to choose a variety which is suitable for the district; and secondly, to try and have the crops tasselling during periods in which rain can usually be expected. Maize must have moist conditions during tasselling, and if hot, dry winds occur during this period, the pollen is shed too early and fertilization cannot take place.

Seed should be sown in drills spaced 3 ft. 6 in. to 4 ft. apart. The wider spacing is essential for the tall-growing, late-maturing varieties. As a general rule, single spacing in the rows gives the best results, the grains being dropped singly, with a distance of approximately 12 in. between the grains for the quick-maturing varieties, and from 15 to 18 in. for the late-maturing varieties.

From 9 lb. to 12 lb. of seed is sufficient to plant an acre when sown in this manner.

The seed drill is the most satisfactory implement for sowing maize, as it ensures a good even spacing, and no loss of moisture occurs during planting, as is often the case where furrows have to be opened up for hand planting.

C. J. McKeon.

Weighing Pigs on the Farm.

W. H. BECHTEL, Instructor in Agriculture, and A. L. CLAY, B.V.Sc., Government Veterinary Surgeon.

ALL farmers engaged in the production of pigs, either as a main occupation or as a sideline, have doubtless felt the need for an easy, reliable, and economical method of weighing pigs.

It is advisable, if not essential, that pigs should be weighed at intervals during the growing stages, as it is by this means only that a correct knowledge of the relation between feeding and gains in live weight can be obtained. All pigs should be weighed immediately before being marketed, as in this way misunderstandings between the grower and the factory will be obviated.

Plate 53.
Weighing Basket made with Lawyer Vine.

On the Atherton Tableland we have found that a combination consisting of a spring balance and basket (see illustrations) fulfils the required conditions as near to perfection as reasonably can be expected. The contrivance has the added advantage of being easily portable.

The basket is made of lawyer vine (which is obtainable locally), but imported basket canes would probably serve as well should lawyer vine be unprocurable. Briefly, it may be described as being of a woven open-mesh type, shaped like a blunt-nosed bullet, and standing 48 inches in height, with a diameter of 24 inches at the top and tapering off to 10 inches at the bottom. The vertical ribs are in one piece, being continuous around the bottom of the basket. They are $\frac{3}{4}$ inch to 1 inch in diameter, nine in number, and spaced 4 inches apart at the top, coming together to a folded-over interlaced cap at the

Plate 54.
Spring Balance and Basket in use.

bottom, and finally finished off into a woven top. The cross stays are of $\frac{3}{8}$ inch diameter, being three-ply used in a twisted woven fashion in and out of the vertical ribs, commencing at the top with an 8-inch wide close section, then passing around the basket in a spiral fashion, beginning with a 4-inch spacing and gradually reducing to a 2-inch spacing at the bottom. These cross stays are held in position by looping a light cane from top to bottom along each rib.

To strengthen the hard-wearing parts, especially the bottom, small canes are interwoven to form a close-filled cap. Upon completion the weight of the basket ranges from 23-25 lb. when green, this being reduced to 16-18 lb. when dried out.

It is not anticipated that the average farmer will be able to make these baskets, but with the description given, together with the illustration (plate 51), any basket-maker of repute should have no difficulty in making them.

The spring balance used has been of the "Salter" type and capable of weighing up to 300 lb. The only other equipment necessary is an upright beam made of a 6-ft. length of 4 x 2 inch timber, a lever made of an 8-ft. length of 3 x 2 inch timber, one bolt and nut, and one open eye-bolt and nut. The lever is bolted into the free end of the upright so as to make a hinged joint. In the illustration (plate 52) the basket is shown outside the pig pen for clearer definition; but in actual practice the lever is worked from outside and the basket with the pig in it is raised into the air from inside the pen.

No difficulty has been found in getting pigs into the basket, and in point of fact, after having been weighed several times, pigs have been found to walk into the baskets of their own accord. Pigs from 25 lb to 200 lb. have been weighed with ease.

SWEET POTATOES AND ARROWROOT FOR PIGS.

With the approach of spring, farmers are considering their cropping programmes, and so the time is opportune for considering the value of such root crops as sweet potatoes and arrowroot as pig foods. These two crops are well known to most coastal pig farmers and can be grown in most places where there is a sufficient rainfall and a long summer season.

Under similar conditions the yield of pig feed per acre from arrowroot and sweet potatoes is several times that from maize grain. This fact alone makes these crops worthy of consideration, but they also have the advantage of being less susceptible to periods of dry weather and are usually freer from pests. In the case of sweet potatoes, some growers claim that they are worth growing for the vines alone. The vines of the sweet potatoes and the stalks and leaves of the arrowroot provide a large quantity of succulent green food.

If it is necessary to harvest and feed these crops by hand, the labour involved is considerable; but both crops can be fed off by pigs, and where the paddocks are made pig-proof, and some temporary fencing is used to partition off a small portion of the crop for the pigs to harvest, excellent results are obtained. If pigs are allowed to run over the whole crop a good deal of waste results. They should, therefore, be confined on an area which they can clean up in about one week.

Arrowroot is frequently boiled before being fed to pigs; but, although the boiling does increase its nutritive value somewhat, it is doubtful whether the increase warrants the great amount of labour required to dig, cart, and boil the bulbs, especially when it has been demonstrated that pigs do remarkably well by harvesting the crop for themselves.

Sweet potatoes and arrowroot are not complete foods in themselves, and must be fed in combination with foods rich in protein, such as separated milk or meat-meal. The more extensive use of these two crops, in conjunction with the separated milk at present available, would enable coastal dairy farmers to increase their output of pigs greatly, and this would be very desirable in the interests of the pig industry at the present time.

L. A. Downey.

Queensland Pigs Successful at Sydney Show.

QUEENSLAND pig breeders have for a long time considered their stock equal to the best in the Commonwealth, and the competition at Royal Shows in this and other States certainly provides evidence in support of this belief.

Plate 55.

Tamworth sow, Wattledale Trilby, bred by J. Barkle and Sons, Wattledale Stud, Kingaroy, and owned and exhibited by Wide Bay Stud Piggery, Gympie. Wattledale Trilby is by Wattledale Top and from Taitlands Queen.

Plate 56.

Berkshire boar, Woodbine Lentonious 5th, bred by F. Bach, Woodbine Stud, Oakey, and owned and exhibited by Wide Bay Stud Piggery, Gympie. Woodbine Lentonious 5th is by Roselock Ronnie and from Lenton Patience (imp).

At the 1937 Sydney Royal Show a team of six pigs from a Queensland stud was particularly successful, winning two breed championships, four first prizes, one second prize, and one third prize.

The two champions of this team are shown on the previous page, the photographs having been taken since their return from Sydney.

Plate 57.

Farmers listening to an address on pig accommodation on the occasion of a field day arranged by the Gympie District Pig Breeders' Association on the property of Mr. W. Dawson, Wonga, via Woolooga.

The movable sheds and runs as seen in the illustration were greatly admired by visitors for their practicability and low cost.

SICK PIGS ARE UNPROFITABLE.

The healthier the pigs the more rapid and more economical are the gains in live weight. Keep your pigs healthy by:—

Always having the yards and runs free of mud holes.
Providing clean water.
Frequently and regularly cleaning and disinfecting.
Keeping quarters dry, clean, and free from draughts.
Feeding proper rations.
Grazing pigs on clean pasture.

Factors in the Contamination of Milk and Cream.

E. B. RICE, Dairy Research Laboratory.

OF all the factors responsible for depreciating the quality of milk and cream, the activities of bacteria, the most lowly forms of life, easily assume major importance. Milk from the udder of a healthy cow contains very few bacteria, but it is not long before many are added from various sources. The chief points from which these may enter are:—

1. The cow.
2. The milker.
3. Water.
4. Bails and surroundings.
5. Air and feed.
6. Utensils.

The Cow.

Milk from the udder of a healthy, well-fed cow contains very few bacteria, these being mainly types which have entered through the teat canal, and, fortunately, they are very slow in bringing about changes in milk. However, the milk from a diseased beast may have an abnormally high bacterial content which would infect the milk from other animals mixed with it. Furthermore, such milk might spread the disease amongst persons or animals consuming it.

Immediately after it is drawn from the udder, the milk becomes more or less contaminated, the bacteria falling from the coat of the animal with dust particles and loose hairs. It is therefore necessary that animals should be kept reasonably clean, and that the udders and near portions of the body should be wiped with a damp cloth, moistened with weak Condy's fluid. The wiping of the udders is also beneficial

for the reason that bacteria cannot fall from a wet surface. The number of germs ordinarily dropping from the coat of the animal into the milking pail is considerable. An investigation of the matter has shown that in a dairy where the animals were divided into two groups, the group whose udders were not wiped added an average of 7,000 bacteria per cubic centimetre (about ten drops) to the milk, whereas the group whose udders were wiped contributed an average of only 700 bacteria per c.c. However, attention should be called to the necessity for frequent changing of the cloths, as the benefits will be lost if one rag is used for, say, twenty cows. A further essential is that the cloths should be boiled after each period of use and hung to dry in a dust-free place.

The Milker.

Many dairymen fail to recognise the extent to which the milker influences the quality of the product. Material from the hands, clothing, and mouth of the person gets into the milk, the extent of the contamination from this source depending upon the personal habits of the individual. Disease germs, too, may enter the milk from a person suffering from disease, possibly causing a widespread epidemic in a district. Clean hands and clean clothing are important considerations in the hygienic production of milk, The hands should be washed immediately before milking each cow; and clean overalls, kept only for milking, would be a decided advantage. Facilities for washing the hands, such as a washbowl, water, soap, and towels, should be provided in every dairy.

Closely related to the milker is the question of sanitary methods. Figures quoted by an American authority reveal the fact that, on ten farms where the milkers were inexperienced in cleanly methods, the bacterial counts averaged 2,500,000 per c.c. When ten men experienced in sanitary methods milked on the same farms the counts were reduced to an average of 9,000 bacteria per c.c. In another investigation carried out on ninety farms in two months of one year, before sanitary methods were introduced, the bacterial counts averaged 393,000 per c.c. On the same farms in the same months a year later, after sanitary methods were adopted, the counts on the milk averaged 55,000 per c.c.

The methods by which these results were achieved were: —

(1.) Washing the udders free from dirt and milking with clean, dry hands.

(2.) Sterilisation of pails, cans, strainers, &c., with boiling water.

(3.) Cooling by submerging the cans in tanks of spring or ice water.

Water.

Clean, pure drinking water is required for dairy stock. Water from stagnant pools, dams, &c., is a menace to cream quality, for the animals wading into such places pick up microbes on their coats which later, during milking, fall from the body into the pail. The microbes rapidly multiply in the favourable food medium. In this manner such common faults as ropiness and gassiness often originate; and the microbes, once established in the bails and utensils, become difficult to eradicate. Careful attention should be devoted to the wiping of the udders of animals which have access to polluted water, and, if possible, it should be fenced off.

Buildings and Bails.

Milk of good quality can be produced where bails, buildings, and yards are not elaborate, but where precautions are taken against factors known to militate against cleanly production. In fact, the writer has in mind a dairy in Brisbane which produces certified milk, such milk having to conform to a maximum bacterial content of 30,000 per c.c., which is regarded in all countries as a fairly rigid standard. It is safe to assert that the buildings on this farm would be no better than those on 50 per cent. of the farms in any of the leading dairying districts of the State; but sound methods are the secret of this man's success.

Liberal applications of lime to the floors and the whitewashing of the walls of the bails at regular intervals check bacteria. The daily carting away of all manure which has accumulated in the yard and on the floor of the bails is a matter of routine in any well-kept dairy. If this is not done, the manure becomes pulverised into dust, which is blown about the buildings and ultimately gets into the milk. Among the microbes found in manure are types responsible for gassy fermentation, which is most objectionable. The handling of dirty leg-ropes and stools without washing the hands afterwards is a practice which calls for condemnation. Good ventilation and plenty of sunlight help to achieve choice quality, and so the bails should face the north to gain the maximum benefit from the natural light.

Air and Feed.

The air in the bails, so long as the yards and floors are kept in proper order, has not such a serious contaminating influence as might be expected. The microbes which are transported by dust particles have to be of resistant species or they are destroyed by the direct sunlight, absence of moisture, and lack of food. On the other hand, with a dirty and dusty yard, the air is literally teeming with millions of microbes, many being very injurious to milk. The feeding of hay and silage during milking should be discontinued, because yeasty cream and other defects are brought about by microbes in the dust from such foods.

Condition of Utensils.

Of the original bacterial contamination of milk and cream, 80 per cent. is traceable to a failure to keep the utensils thoroughly clean. Boiling water should be used after all traces of milk solids have been removed. This is done by first rinsing the utensils with cold or lukewarm water to dissolve the albumin, which would coagulate and form a thin film on the surface of the utensils if hot water were brought directly into contact with it, but which is soluble in cold or warm water. The vessels are next scrubbed with hot water in which washing soda has been dissolved. A scrubbing brush should be used for this purpose, as cloths would be ineffective. The utensils should then be submerged in the boiling water for at least one minute and then placed on the draining rack so that the water can run off. Their heat causes them to dry rapidly. Since all bacterial food is removed by washing, all bacteria killed by boiling water, and all moisture drained away or evaporated by the heat, any few bacteria which may re-enter from the air of a hygienic dairy will not cause undesirable changes in milk subsequently placed in the utensils.

CARE OF MILK AND CREAM.

After the milk or cream is produced care must be taken to avoid any further contamination and to prevent an increase in the numbers of the germs which have entered, otherwise all efforts previously expended in producing a choice quality article may be forfeited.

Some of the chief factors in the development of after-production faults are:—

1. The state of the dairy.
2. Improper cooling.
3. Care during transit to factory.
4. Faulty containers.

The Dairy.

Many old-style dairy houses, through lack of proper ventilation, are veritable hotboxes. At the high temperatures in such dairies on hot summer days the bacteria will multiply with enormous rapidity and nullify all efforts made to keep them in check during the previous handling. The recent amendments to the Dairy Produce Act have remedied this matter by providing for a new type of dairy house which ensures more adequate ventilation. In this new dairy with gauze or wire-netting at the top and bottom it will be necessary to cover the cream to prevent contamination in dusty weather. Where sufficient water is available the inclusion of a concrete trough about 8 inches deep by 2 feet 6 inches wide in the southern end of the dairy is an aid to the cooling of cream, but frequent replacement of water is required in order to ensure satisfactory conditions.

Cooling.

The difficulty in the way of cooling in many of the dairying districts of this State is fully realised; but it is nevertheless considered that much more could be attempted by progressive farmers than is usually done at present. The provision of a trough, or the use of a surface cooler, enables a proper cooling of the cream to be effected immediately it is separated. The writer has inspected records kept by farmers who have installed coolers, and in every instance it was observed that, even on the hottest days, the cream rarely rose more than a few degrees over 70° F.

A significant fact also was that, since the adoption of cooling, second-grade cream has been unknown. A cheap cooler can be procured from factories or stores in dairying districts for about £2. The importance of keeping cream at from 60 to 70° F. lies in the fact that the lactic acid bacteria which are required to bring about the desired ripening of cream are most favoured by this temperature range, their growth being so rapid that other species are gradually destroyed, or are prevented from multiplying. At higher temperatures many undesirable bacteria are able to compete with the lactic acid bacteria, resulting in the development of "off" flavours, such as gassy, yeasty, rancid, cheesy, and unclean or tainted cream.

Transit to Factory.

During its transit to the factory the cream should be protected from direct sunlight in waggons which are covered by a suitable hood. The development of tallowy and metallic flavours is accelerated by heat

and sunlight. Direct sunlight will turn milk tallowy in ten minutes; and in diffused light the taint will sometimes appear in forty-five minutes. Cream should not be conveyed in waggons which are also used to carry odoriferous products, owing to the ease with which cream will absorb odours from its surroundings.

Faulty Containers.

Faulty cans are a menace to the cream contained in them. Badly dented, rusty cans, or cans from which the tinning has worn off, will quickly deteriorate their contents. Their influence can be gauged from recent research in England which has shown that 0·2 parts of copper, or 2·0 parts of iron, per million will affect the flavour of butter. In this connection, the harmful effect of using kerosene tins on the dairy is often overlooked. In addition to the possibility of inducing metallic flavour, bacteria which lodge in the seams of these tins are injurious to quality.

Anyone who will use reasonable care can produce milk or cream of choice quality. Elaborate equipment is not necessary, but simply an understanding of the methods of preventing contamination from various sources.

FEEDING ON THE DAIRY FARM.

Finely-ground cereals should be used in the early stages of a calf's life. Under the systems for the rearing of calves in Queensland, the cereal meal is first introduced into the ration about the second or third week. As the animal grows, and is better able to cope with it, the grain may be less finely ground; and, by the end of the third month, only the very hard grains require crushing. The first year of a calf's life is the period in which it masticates most thoroughly. From then on, the proportion of whole grain that passes through undigested gradually increases. The reverse is true of the roughages. It rarely pays to chaff or mill hay for calves.

With the milking cow productivity may govern the method of preparing the food. Further, when certain foods which are normally ground or crushed are low in price, the extra production which results from grinding may not pay for the cost. An exception must be made when stock are being prepared for exhibition or test.

It is a safe rule always to crush corn. All concentrates for high-producing cows should be in meal form. This does not mean that the food must be powdery. Excessively fine meals are usually dusty, and unless moistened with molasses or water, they are wasteful; furthermore, the irritation they cause when taken in with the breath may actually induce a dislike for a good food.

Roughages are usually fed uncut. Stalky or unpalatable roughage may be chaffed to encourage consumption or to make the inclusion of a concentrate simpler. Food which is to be moistened with molasses should be chaffed.

The fine chaffing of hay for dairy cattle is not justified even for stud or exhibition cattle, as it impairs digestibility by suppressing rumination. Whole plant feeding is often employed, e.g., corn and sorghums. The coarse chafling of the sweet sorghums is necessary. Grain crops require better treatment—it may even pay to chaff, though as a rule whole plant feeding of cereals should be done as silage.

How to Keep Churns Sweet.

J. D. OGILVIE, Dairy Instructor.

Butter absorbs foreign odours very rapidly. If the churn is not kept in a pure and sweet condition, the butter will be exposed to undesirable odours and its commercial quality will be impaired. The best cream will not produce a high-grade butter if a foul-smelling churn is used.

A churn should be given two rinsings at the conclusion of each day's churning—the first with lukewarm water, and the second with scalding hot water.

Some butter-makers turn the churn over with the cover hole down; others prefer to have the cover hole turned up. When the churn is turned with the cover hole down, the remaining steam on the inside of the churn cannot escape. It will condense inside the churn, and cause it to remain in a damp condition overnight. If, however, the churn is turned with the cover hole up, the dust and other impurities, if present, are likely to settle in the churn.

The best method is to turn the churn over so that the cover hole points to one side. The steam then can escape, and the heat absorbed from the boiling wash water will dry the churn thoroughly. The churn, however, should be drained thoroughly first, as otherwise some water will remain in the bottom.

Some makers rinse the churn only once and use scalding hot water. This method is likely to scald the remaining curd on to the wood. One rinsing is not enough to ensure a clean churn. The first rinsing with lukewarm water removes the major portion of the buttermilk and brine, and, to a certain extent, warms and preheats the wood of the churn, so that when the second rinsing with scalding water is completed, the churn receives the full benefit of the scalding. In addition, the churn is clean and no food on which germs can thrive is left. The churn is left warm, and in that condition will dry out quickly. If the churn is cleansed in the manner described above, and then, at the end of the week, treated with freshly slaked lime, it can be kept in a sweet condition.

A bucketful or two of the liquid lime will be sufficient for each churn. If the churn is rotated a few times, the lime will spread over the inside of it. The churn should be allowed to remain in this condition until ready for use again. Before it is used again, some warm water should be put into it, and the lime will readily come off; but, if it has been allowed to remain in the churn too long, it will form a lime carbonate and will be more difficult to remove. Lime is the safest and one of the best disinfectants and deodorants that can be used in a factory. Some factories use it every day on all wooden utensils, such as butter workers and packers.

COTTON.

The harvesting of cotton is still in progress, but most of the consignments now being received at the ginneries consist of scrap cotton, an indication that the season is drawing to its close. Considering the extremely dry conditions that ruled throughout most of the cotton areas until December, and the long periods of excessive heat which followed, the quality of the cotton picked this season has been remarkably good. There was considerably less of the yellow-spotted grades, and an increase in the percentage of mature grades, particularly in the case of the newer hard-bodied varieties of medium staple. As this class of cotton is required by the Australian spinners, the progress made with these varieties is of special importance.

Steady, soaking rain is urgently required in all cotton areas to allow of the preparation of seedbeds, and to replenish subsoil moisture, a most important factor in the successful growing of cotton, because of the deep-rooting system of the plant.

The distribution of seed has commenced, and applications are coming in steadily.

SUGAR.

During the early part of July, rather cool, dry conditions prevailed in all cane areas; this checked effectively the growth of the mature crop, while frost caused slight damage to young cane in isolated areas.

Good rains were experienced in the far North during late July, while the drought conditions in the southern districts still persist.

Many of the mills are now in operation, and the cane is generally above normal in sugar content. Crops appear to be cutting up to estimate, so that there appears every possibility of a 700,000-ton sugar crop.

A Tractor Operated by Suction Gas.*

G. A. CHRISTIE.

HITHERTO the use of suction or *producer* gas has been confined, more or less, to stationary engines. Attempts have been made to design a suitable generator for use with motor vehicles, and these have proved satisfactory under certain conditions; now a farm tractor which has been designed to use producer gas as the explosive mixture has been manufactured by the Howard Auto Cultivator Works.

The principle of operation is that a mixture of combustible gases is formed when charcoal which has been moistened is burnt in a limited supply of air. In the same way that petrol vapour ignites with a spark when mixed with air, so producer gas burns and expands, to provide the power stroke of the engine. In designing the gas generator (see plate 56) the manufacturers have endeavoured to combine efficiency in working with economy of space and ease in operation.

Plate 58.

Illustrating the Tractor operated by Suction Gas.

The tractor, which develops 40 horse-power, is fitted with a 5-feet rotary hoe; this is easily detachable and the tractor may be used as a stationary engine, or any other implement may be attached for cultivation purposes. The hydraulic lift by which the hoe is raised is rapid in

* From *The Cane Growers' Quarterly Bulletin* (Bureau of Sugar Experiment Stations) for July, 1937.

action, and thus allows cultivation to be carried closer to headlands than is the case with a slower type of lift. The tractor is fitted with a full set of pneumatic tyres, which enables it to be driven with comfort, and without any adjustment, over highways. It is also claimed that they give a higher general efficiency in operation. The unit is fitted with self-starter and headlights, the power for which is developed through a 12-volt battery.

Before starting any tractor it is necessary to check the various oil and water levels, to grease the several points, &c., which jobs usually occupy about twenty minutes. With the suction gas tractor, it is found that if the fire is started before commencing this work, gas may be produced by the time the examination is complete. Thus the period elapsing between lighting up and the operation of the engine on gas is not more than thirty minutes. The engine is started on petrol, and is gradually switched over to the gas. This phase occupies only four or five minutes at each starting. The producer is refilled with charcoal at intervals of one hour, and since the engine is not stopped, very little time is taken up in that operation.

Plate 59.

Suction Gas Tractor with Rotary Hoe Attachment.

Since its introduction to the Bundaberg area, Messrs. Douglas Bros., of South Kalkie, have kept accurate records of all costs of operation. The tractor and rotary hoe have been used in ratooning cane, cutting and turning under trash and green manure crops, and in normal cultivation of fallow land. The average depth of working (except in ratooning) is 9 to 10 inches of firm soil. In the 233 hours

of operation, 140 acres have been cultivated with the following operating costs:—

	£	s.	d.
Charcoal—187 bags at 1s. per bag	9	7	0
Lubricating oil—changed every 40 hours—12 gallons at 5s. 5½d. per gallon	3	5	6
Petrol for starting—9 gallons at 1s. 10½d. per gallon	0	16	11
Gear lubricant	2	9	6
Total	£15	18	11

It will be seen that the running costs per acre with the rotary hoe have been less than 2s. 3½d., while the hourly cost of operation is less than 1s. 4½d., excluding the wages of the driver. From these figures it will readily be appreciated that suction gas may be employed profitably in farm tractors, without any loss of efficiency, where a plentiful supply of cheap wood for charcoal production is available.

MEATWORKS BY-PRODUCTS.

Meatworks by-products are all of organic origin, and vary in composition with the part or parts of the animal used in their preparation.

Blood is used either as a foodstuff (blood meal) or as a fertilizer (dried blood), depending on the quality of the manufactured product. Blood meal is not available on the Queensland market and requires no discussion here. Dried blood contains 81 per cent. crude protein (nitrogen 13 per cent), and other organic matter plus moisture 19 per cent. It is a widely-used nitrogenous fertilizer, comparable in many respects with sulphate of ammonia in the rapidity with which the nitrogen is available to the plant.

Bone is finely ground in the preparation of bone flour, bone meal, and bone dust. An average quality bone dust contains crude protein 22 per cent. (3½ per cent. of nitrogen), tricalcic phosphate 50 per cent. (23 per cent. phosphoric acid), and other organic matter plus moisture 28 per cent. Bone dust is a slow-acting phosphatic manure. The more highly-refined products find an outlet as a constituent in many stock licks, which are valuable for stock grazing on phosphate deficient soils.

Waste flesh is the basis of meat meal, the dried residues being finely ground. It invariably contains a certain amount of bone. Meat meal (crude protein 63 per cent.), like blood meal, is an excellent protein concentrate for stock and the available supplies are readily absorbed on the Queensland market. It also contains fat. When used for fertilizer purposes, the fat is first extracted during preparation.

Meatworks manure is a mixed product containing blood, bone, and waste flesh. It contains approximately 6 to 3 per cent. nitrogen and 14 to 23 per cent. phosphoric acid, and is widely used in the State. It should be noted that as the nitrogen increases the phosphoric acid decreases, and *vice versa*.

All bone flour, bone meal, and meat meal products used for feeding animals must be subjected to a steam heat at a temperature of not less than 250 deg. F., equal to an indicated steam pressure of 30 lb. per square inch for at least two hours during the manufacturing process. They must be prepared only from animals slaughtered for human consumption.

F. C. Coleman, Dairy Branch.

Summer Fodder Crops in the Maranoa.

C. H. DEFRIES, Instructor in Agriculture.

THE possibilities of summer hay and fodder crops for early spring planting, if the weather is favourable, are now engaging the attention of farmers in the Maranoa district. Land for such crops should, of course, be prepared now. Ploughing may be impracticable until it rains, but there are many paddocks already prepared for wheat which could not be sown during the dry weather. When replanting these areas it would be advantageous to reserve at least a portion of the area for summer fodder crops.

Pre-eminent among the fodders suited to the district is Sudan grass. The risk of prussic-acid poisoning associated with this crop can be reduced by purchasing seed from a reliable source to ensure freedom from contamination by the more toxic sorghums. Careful grazing is also necessary. Stock should not be fed on young crops, or crops which have been checked in any way during growth. It is also inadvisable to turn hungry cattle into a Sudan grass paddock.

Plate 60.

Cutting a Heavy Crop of Sudan Grass.—A harvesting scene on a Central-Western pastoral holding on which fodder cultivation is practised extensively.

Good quality hay can be made from Sudan grass in the Maranoa, and it constitutes a valuable standby for all stockowners during winter or other dry periods. Fine-stemmed plants are preferred by stock, and facilitate both harvesting and curing the hay. For this reason, wide drills which strain the cutting mechanism of a mower or binder and tend to develop coarse plants should be avoided. Planting with the wheat drill, at the usual spacing for wheat, gives excellent results if the seed is sown at the rate of 7 lb. per acre.

As a quick-growing crop Japanese millet is coming into wider cultivation on the better loams of the eastern portion of the district.

The crop may be grazed when quite young, and in feeding off there is no risk of stock poisoning. For best results, however, it is wise to allow growth up to 9 to 12 inches. The hay is good, although yields are not so heavy as Sudan grass; 10 to 12 lb. per acre is the usual sowing.

Plate 61.

A Field of Sudan Grass.—A crop grown for fodder on Coreena, a pastoral property near Barcaldine.

West of the Darling Downs cowpeas are not in general use for fodder or hay, although they do well enough on the lighter soil types and form a very useful supplement to other fodders. Stock often show a dislike to the fresh green growth when they are not used to it, but eat it readily when cut. The value of this legume in supplying a protein supplement when fed with native pasture, and its capacity to enrich the soil through the action of nitrogen fixing bacteria in the nodules of the roots, should not be overlooked—particularly in sandy soils where native legumes are of little consequence.

Broadcast sowings of half a bushel are usually made with small seeded peas such as Poona. When sown in rows, 8-10 lbs. of seed is sufficient.

GROW COTTON.

Cotton growing in the south-eastern portion of Queensland is at the present time in an unique position, as it represents one of the few primary commodities for which there is an unfulfilled demand in Australia. Since the last Commonwealth Bounty Act came into operation, there has been a rapid expansion in the cotton spinning and manufacturing industries in Australia, with a resultant increased demand for raw cotton.

The cotton industry is established on a co-operative basis and is one of the few industries in which the product grown is handled by the

growers' organisation from the field to the manufacturer. This organisation, the Queensland Cotton Board, takes control of the seed cotton when it leaves the farm, transports it to the nearest ginnery, gins the cotton, markets the lint, and manufactures by-products, all the resultant profits being returned to the grower.

For the past two seasons the average return paid to growers for seed cotton delivered at their nearest railway station has been approximately 4d. per lb. of seed cotton, and, considering the increased demand by the farmers for the high lint percentage cottons, it is assumed that the average net return of 4d. per lb. will be maintained at least for the next three years.

The advantages of cotton as a rotational crop in any farm system, and especially in conjunction with dairying, should appeal to most farmers and primary producers. Over a number of years, cotton has proved its adaptability to the conditions within the cotton belt and can be successfully grown on most of the main soil types within this area. It undoubtedly offers distinct advantages over many other crops on account of its drought-resistant qualities, and in the past two seasons, which have been particularly severe ones, profitable yields have been obtained where other crops failed or gave only poor returns.

The suitability of cultivations newly broken up out of the original grasslands has been studied carefully for several years, and it is obvious that substantial benefits are obtained on most soils when cotton is grown in rotation with pastures of a sufficient stage of establishment. The benefits which may be expected can be grouped under three headings—increased yield per acre, improvement in lint quality, and reduced costs of production.

Observations have definitely shown that new cultivations, or recently ploughed Rhodes grass paddocks, produce heavier yields of lint cotton than do adjacent cultivations on which crops of cotton have been grown for more than five years in succession. The explanation of the increased yields may be found in several factors. The more important are the restriction of the soluble plant food nitrate-nitrogen in the soil to levels most suitable for the cotton plant and the maintenance of adequate supplies of organic matter (roots, leaves, stems, &c.). The latter prevents the soil particles from packing and gives to the soil an open texture that allows of the quick and complete absorption of ordinary storm rains.

Another important feature of the pasture-cotton rotation is the reduction of production costs, brought about by the lessened number of workings required to keep the field clean in the first three or four seasons after being brought under cotton. Weed and grass growth is less, and the surface does not become compact with the occurrence of heavy rains.

To establish the Queensland cotton growing industry on a firm basis, it is incumbent upon the growers to supply fully the requirements of the spinners, and to accomplish this increased areas are necessary. When the general suitability of cotton for most of the soil types of the south-eastern portion of this State is considered, it becomes all the more apparent that growers cannot afford to exclude cotton from their system of farm cropping.

E. W. Peters.

In Memoriam.

ALFRED ERNEST GIBSON.

OF the late Mr. Alfred Ernest Gibson, Director of Agriculture in Queensland, whose death occurred at his home at Manly (Q.) on 8th July, it may be said with truth that his life was one of devoted service to the State. His illness had been a protracted one, and the end was not unexpected; but, nevertheless, the news of his demise came as a shock to his friends and associates in the Department of Agriculture and Stock, by whom he was held in high esteem and affection. The intimation of Mr. Gibson's death also called forth expressions of deep regret from primary producers in various parts of Queensland who had learnt to appreciate his merits as an authority on agricultural methods, as well as his fine qualities as a man.

Born in Victoria in 1873, the late Mr. Gibson graduated as Dux of his year from the Dookie Agricultural College in that State in 1890. He gained a varied experience as manager of butter factories in Victoria, as manager of sheep properties in the western part of that State, and in dairying, general farming, and fruit-growing. Before coming to Queensland, he was engaged in farming on his own account in the Maffra district in North Gippsland. He left for Queensland in 1909 and joined his brother, a surveyor, in the field study of soils, grasses, and timbers in the central-western portion of the State.

In 1911 Mr. Gibson accepted an appointment in the Department of Agriculture and Stock as farm foreman at the Queensland Agricultural College, Gatton. Two years later he was promoted to the position of overseer and experimentalist at the college. He was appointed instructor in agriculture, with headquarters in Brisbane, in 1914, and fourteen years later became senior instructor. In 1933 he was appointed Acting Director of Agriculture, an appointment which was subsequently confirmed. Mr. Gibson also acted as deputy for the Director of Marketing on various commodity boards, and was a Government representative on the executive of the Council of Agriculture.

The announcement of Mr. Gibson's election for the position of Director of Agriculture in 1933 was received with approbation by the primary producers throughout Queensland, because there was a general feeling of confidence in his ability to discharge

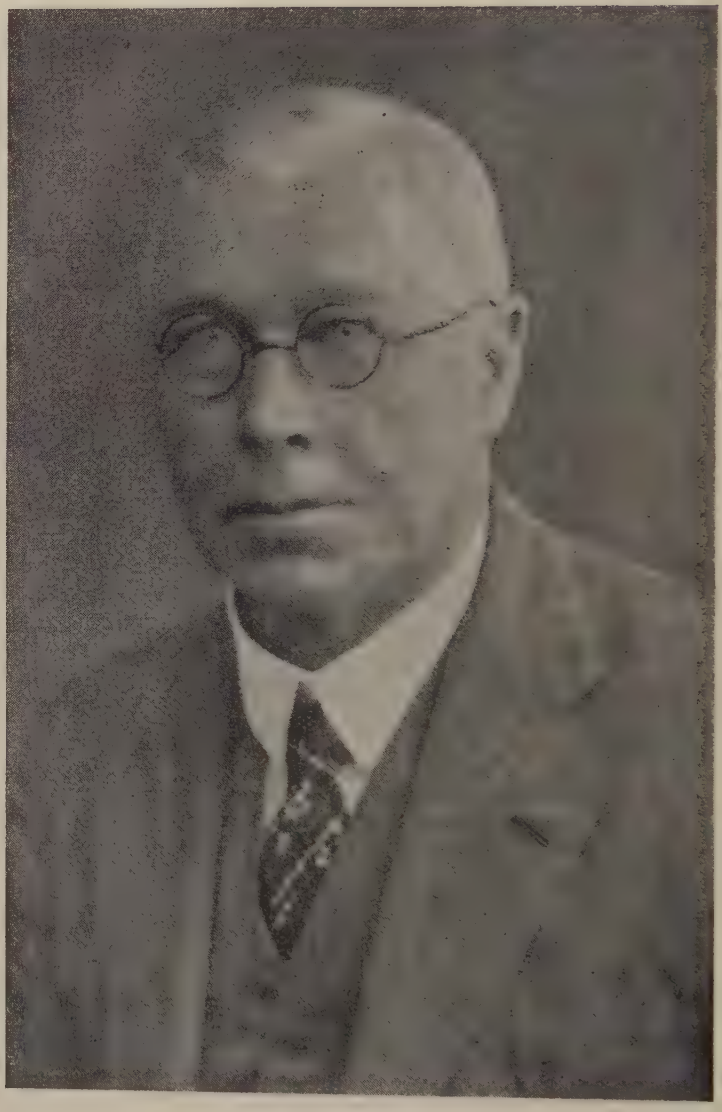


Plate 62.
The late A. E. Gibson, Director of Agriculture.

satisfactorily the onerous duties of the position. It was widely recognised that Mr. Gibson had a thorough knowledge of agricultural science and practice which fitted him for the task of directing the activities of so important a branch of the Department of Agriculture and Stock.

Devotion to duty, earnestness, thoroughness, and a keen personal interest in the work on which he was engaged were outstanding characteristics of the late Mr. Gibson. His mind was essentially practical and efficiency was his primary aim. Allied with these admirable attributes was an unassuming and tolerant attitude to all with whom his duties brought him into contact. At no time did he attempt to dictate to the man on the land as to what he should do, but he sought to help him with advice which he was ready always to justify and support by logical reasoning. In this way he was able to inspire confidence as a practical man whose guidance in respect to the varied and complex problems associated with the growing of crops and the care of domestic animals might safely be followed. His home and his garden, fishing and cruising on Moreton Bay in his fine power yacht—the work of his own hands and a triumph of the boat builder's craft—were "Gibby's" leisure-time hobbies.

TRIBUTE BY THE PREMIER.

The Premier (the Hon. W. Forgan Smith, LL.D.), on behalf of the Government, tendered sympathy to Mr. Gibson's widow and family in their bereavement. The deceased gentleman had given many years of valued service to Queensland, he said, and up to the time of his death he was directing many experiments of great potential value to primary producers, and his loss would be felt severely.

MR. BULCOCK'S EULOGY

"It is with deep sorrow that I learnt of the death of Mr. Gibson," said the Minister for Agriculture and Stock (the Hon. Frank W. Bulcock).

"Mr. Gibson joined our service in 1911, and during the whole of his association with the department he made material contributions to the well-being of agriculture. Many farmers settled throughout Queensland will have kindly recollections of Mr. Gibson as an instructor and experimentalist at the Gatton

Agricultural College. Later, in his associations with experimental work, he achieved a degree of success which few people gain in the services of agriculture.

"Mr. Gibson was actively associated with the economic side of the industry and was Government representative on several pool boards, the more important of which were the wheat pool and the plywood and veneer pool. Here his business acumen and long association with farming problems enabled him to make very valuable contributions to economic organisations associated with this department.

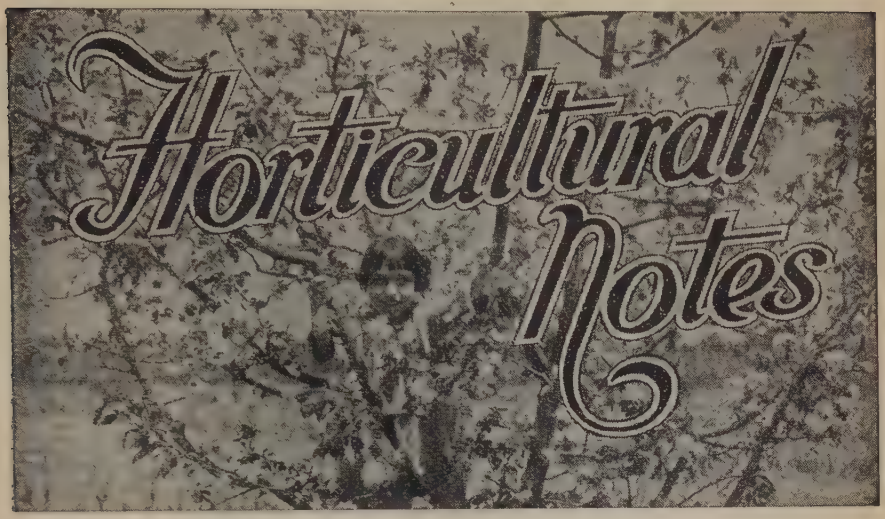
"I feel that not only have I lost a very valuable officer, but one whose counsel was always sound and worthy of serious consideration.

"Last year Mr. Gibson fell ill, and some doubt was expressed about the possibility of his recovery, but, while he was still a very sick man, he insisted upon returning to the department to carry on his duties. During his recent illness every unit of the Service, including myself, felt his absence greatly.

"Mr. Gibson's work for agriculture has made his name a family word wherever farming problems are discussed, not only in Queensland but in agricultural councils throughout Australia.

"I can only offer my very sincere sympathy to his widow and family."

Flags were flown at half-mast over the head office of the Department of Agriculture and Stock in Brisbane and at branches throughout the State on the day on which Mr. Gibson's death was announced and on the day of the funeral. After a brief Service at his home, the interment took place in the beautiful bushland cemetery at Hemmant, in the presence of a large gathering of his friends and former associates, among whom were representatives of the State Government and Parliament, of every branch of the Department of Agriculture and Stock, of the Council of Agriculture and associated farmers' organisations, of the Royal National Agricultural Association, of the Faculty of Agriculture within the University of Queensland, of the Ex-Students' Association of the Queensland Agricultural College, and of the commercial life of the city. He left a widow, two daughters, and a son to mourn their loss.



Some Tropical Fruits.

No. 16—THE GRANADILLA.

S. E. STEPHENS, Northern Instructor in Fruit Culture.

TWO very similar fruits are known by this title—namely, *Passiflora quadrangularis* and *Passiflora macrocarpa*. Both are commonly grown in North Queensland, although the former is of the greater commercial value, and consequently more frequently met with in orchards. The latter is more favoured by home gardeners.

P. quadrangularis produces a fruit about 6 to 8 inches in length and 3 to 4 inches in diameter. *P. macrocarpa* fruit is usually about 12 inches long by 5 to 7 inches in diameter.

The formation of both fruit is similar. Underlying a very thin translucent skin is a layer of greenish coloured flesh, about an inch in thickness in the *quadrangularis,* and 1½ inches in the *macrocarpa.* The inner surface of the flesh is covered with a parchment-like skin, thus leaving a fairly extensive cavity in the centre of the fruit. This cavity contains a large number of flattish seeds, each of which is in a separate pulpy sac. *P. quadrangularis* contains comparatively more pulp than *P. macrocarpa,* and this constitutes the edible portion of that variety, the flesh usually being too dry, mealy, and tasteless to be palatable. In *P. macrocarpa,* however, the flesh is crisp and juicy and has a flavour quite distinct from that of the seed pulp. With the addition of a little orange juice and sugar a very tasty fruit salad may be made by scooping out and mixing the seed pulp and flesh of this fruit alone.

Vines of Similar Habit.

The two granadillas, usually known as small-fruited and large-fruited to distinguish them, are strong-growing vines of similar habit, growth and appearance. The stems are sharply four-angled, the leaves

are large, entire, ovate, light yellow-green in colour and 6 to 8 inches long. The flowers are large, 4 to 6 inches across, purple and white in colour, with three prominent stigmas and five stamens, and they are strongly and peculiarly scented.

Flowers are produced in small numbers throughout the year and odd fruits are always available. The main fruiting season, however, is during the autumn and winter months, from April onwards, during which time the vines are heavily laden with flowers and fruit in all stages of growth. At this season one of the main reasons for the greater popularity of *P. quadrangularis* with orchardists may readily be understood. Whereas a *P. macrocarpa* vine may carry ten to twelve fruit, *P. quadrangularis* may carry as many dozens of smaller fruit, in the season.

The granadilla is not very particular as regards soil. It has been noted growing quite luxuriantly on volcanic, alluvial, sandy, and decomposed granite soils. It grows on either jungle or open forest soils, but on the latter, which are often deficient in organic matter, the vines show considerable benefit from mulching.

In the jungle areas of North Queensland the vine may often be seen in a flourishing state, thus demonstrating the suitability of our tropical soils and climatic conditions to its growth.

This plant is essentially a tropical one, and although it grows and fruits in the southern latitudes of Queensland, it is only within the tropical area that it is seen growing to perfection. It is susceptible to damage by frost; hence the careful selection of a site is necessary in the sub-tropics. Within the tropics, however, no such consideration is necessary, and the rich profusion of vine and fruit produced by the granadilla in such localities as the Cairns district is ample proof of its tropic-loving propensities.

Seed or Cuttings.

The granadilla may be propagated from either seed or cutting. Seed germinates readily provided it is fresh, but the cutting is recommended on account of its more rapid growth.

Suitable cuttings may be taken from lateral growths and should be not less than 15 inches long, but may be 2 or 3 feet long with advantage. In the tropics, when the planting is done during the rainy season, it is found that cuttings strike more readily if the leaves are not removed from the portion above the ground. This should be one-third to one-half the total length of the cutting. The remaining lower portion should have the leaves removed and should be inserted horizontally or diagonally in a bed of well-prepared loamy soil. They should be planted in their permanent positions in the field at the foot of the trellis posts. It is advisable to plant two cuttings in each bed in case of failures and, should both strike, one may be removed later.

The vines are grown over a trellis support. The type most favoured and giving the best results is that known as a horizontal trellis. It is erected on stout hardwood, bean, or white beech posts, spaced 10 feet apart, in two lines also 10 feet apart. The posts should be 7 feet clear of the ground to allow good head room. They support a strong frame of split rails or heavy saplings placed on their tops, the rails being connected by cross saplings at intervals of about 4 feet. Plain galvanised wire of No. 8 gauge is then run along the trellis, over the saplings at

15 inches intervals, thus forming a horizontal network of wires and saplings. Such a trellis is known as a granadilla shed. It may be built to any convenient length, and the width may be increased by adding extra rows of posts and trellis work.

Plate 63.

Granadilla Cuttings Prepared for Planting.—*a a* Cuttings prepared for dry season and southern planting. *b b* Cuttings prepared for rainy season planting.

Vines may be planted at the foot of every post; but, after the first fruiting, or as soon as the vines become too thick, every second plant should be cut out.

When raising the young vines it will be found that growth is greatly increased by providing small twiggy sticks such as thin bamboos with laterals intact pushed into the ground against the posts for the vines to cling to. As soon as they reach the top of the posts a few light, twiggy branches thrown over the top of the trellis assists the rapid spread of the vines; and, provided they are light enough, such branches soon rot away after they have served their purpose and do not encumber the trellis.

A modified form of trellis is one in which only one supporting row of posts is erected and cross-arms of 2 or 3 feet in length are affixed to the posts, three or four wires being then run through the

cross-arms. This type of trellis is not often met with; and while it may be suitable in localities where the growth of vine is restricted, it is not to be recommended for the tropics, both because of the insufficient area of trellis to hold the vine, and the poor support offered to heavily laden vines. Such insufficient support results in the tearing away of portions of the vine by the weight of the fruit, and the consequent loss of the fruit.

Plate 64.

Granadilla shed carrying twelve-month-old vines.

The fruit is ready for harvesting when the skin becomes clear, transparent, and glossy, and the apex shows a tendency towards yellowing. It should then be clipped from the vine and carefully placed in picking baskets or boxes lined with bagging. Chinese baskets make good picking containers, being light to handle, yet stout.

In packing for market each fruit is wrapped in a sheet of paper, and woodwool packing should be used to cushion the fruit and prevent bruising. Either the standard bushel or one and one-half bushel case is a suitable container.

In many localities natural pollination of the granadilla does not take place and artificial pollination must be resorted to, to obtain a crop. This is simply effected by gathering the ripe pollen with a feather or camelhair brush and placing it on the stigma of another flower. The cross pollination is necessary because of the protandrous habit of the granadilla that is, the ripening of the pollen in a flower before the stigma has matured and is ready to receive it.

The granadilla normally prunes itself by the dying back of the lateral growths after they have produced their crops. Hand pruning may be resorted to with advantage, however, and is sometimes necessary during the fruiting season, in cases in which the growth may be too dense.

Very little experimental work has yet been carried out with respect to the artificial manuring of the granadilla; consequently, no definite recommendation can be made in this respect. However, until more work has been done, the fertilizer recommended for the passion fruit could probably be used with advantage. The mixture recommended by the late J. C. Brunnich for that plant contains 1 to 2 cwt. nitrate of soda, 4 to 8 cwt. blood and bone, 1 to 2 cwt. superphosphate, and 1 to 2 cwt. sulphate of potash, which corresponds to a 7-10-10 mixture. He recommended also a top dressing of 1 cwt. of nitrate of soda per acre, to be applied in the spring.

Plate 65.
The granadilla flower.

Probably the most destructive pest of the granadilla is the green vegetable bug (*Nezara viridula*), which at times destroys numerous young fruits by puncturing and sucking the juices from them. Young fruits so attacked frequently wither and fall, whilst in more mature fruit hard lumps are formed in the flesh.

The treatment recommended for this pest is a spray consisting of 10 lb. resin, 2 lb. caustic soda, 3 lb. fish oil, and 40 gallons water.

Fruit fly and several species of beetles have also been known to attack the fruit at times. The method of control adopted against all these pests usually consists of enclosing the fruit, from quite an early

Plate 66.
Good specimens of *P. quadrangularis*.

stage of growth, in paper bags, the tops of which are tied closely round the stems. Ordinary brown paper bags have been found fairly satisfactory for this purpose. The use of such bags, however, necessitates their removal to ascertain whether the fruit is ready to pick. Furthermore, they tend to become waterlogged and torn in wet weather. A suggestion has been put forward that cellophane bags might be an improvement; and, following this up, a small experiment is now under way to ascertain what advantages, if any, these may have over ordinary brown paper bags.

Diseases observed up to the present have been a leaf spot and a black fruit spot, but so far they have not been regarded as serious.

Plate 67.
Granadilla attacked by the Green Vegetable Bug, *Nezara viridula.*

CULINARY USES.

The granadilla has several culinary uses, and the following recipes may be found worth while:—

Granadilla Fruit Salad.—Take one granadilla of the large variety, cut in half and scoop the seed pulp into a dish. Remove and discard the inner skin, then scrape out the flesh with a fork. Add the flesh to the seed pulp and stir in one half-cup of sugar. A little orange juice may be added, if desired. Set aside for about three hours and serve with or without cream as desired. (Note: The small-fruited variety of granadilla is useless for the above salad).

Granadilla Pie.—Scoop the seed pulp from a ripe granadilla and add about one-half cup of sugar. Remove the outer and inner skins from the flesh, cut it into cubes and place in a saucepan with sufficient water to cover it. Let it simmer until tender (about half an hour). Place the stewed flesh and raw seed pulp in a pie dish and cover with a short pie crust. Bake in a hot oven.

Granadilla Jelly.—Wash the granadillas and cut out all skin blemishes. Cut up the flesh without peeling, and put in a saucepan with sufficient water to cover. Boil for two hours. Place the seed pulp

in a separate saucepan with a little water, and allow it to simmer on the side of the stove. Strain both lots through a fine cloth into another saucepan. To each cup of juice add three-quarters of a cup of sugar, and for each granadilla use the juice of one lemon. Place back on the stove and boil until it jellies.

Plate 68.
A mature granadilla shed carrying a good crop of fruit.

Granadilla Wine.—To make 5 gallons of wine, mash ten granadillas, fully ripe, and cover well with water in an earthenware or wooden vessel. Let it stand for forty-eight hours, then strain off. Dissolve 10 to 12 lb. sugar in hot water, and add to the juice while warm, adding sufficient more warm water to make up 5½ gallons of liquor. Pour into a cask and keep the extra half-gallon aside for filling as the fermentative process reduces the level of the wine each day. When fermentation is finished, which should be in about three weeks, 2 pints of brandy may be added and the bung driven home. The wine may be bottled off in nine to twelve months.

Grapefruit.

R. L. PREST, Instructor in Fruit Culture.

GRAPEFRUIT, the commercial or trade name given to the pomelo—*Citrus paradisi*—is credited with having arisen from the tendency of the tree to bear its fruit in clusters, and it is unlikely that it will ever be superseded by the correct horticultural term, pomelo.

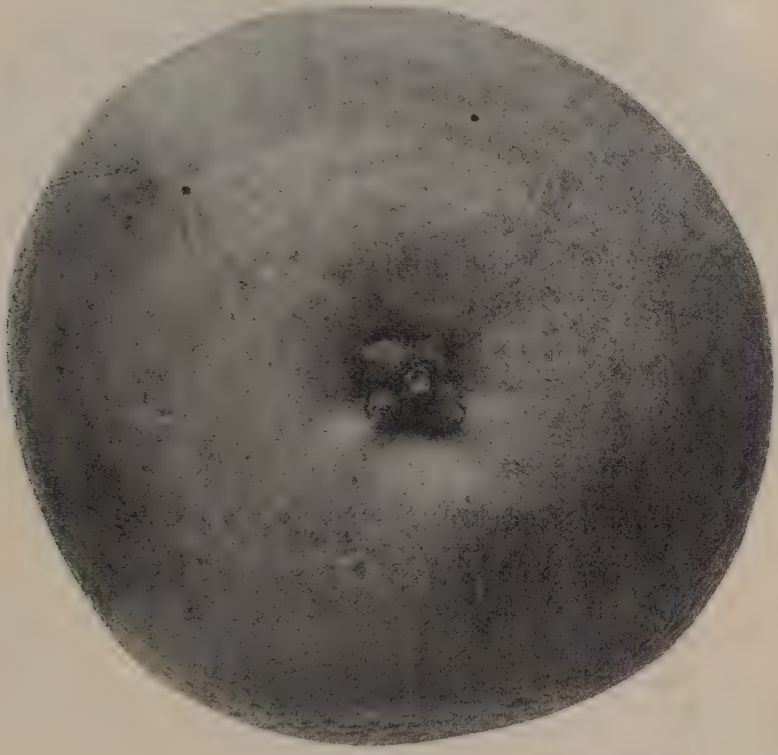


Plate 69.
Marsh Grapefruit.

The tree is a vigorous grower, handsome and symmetrical, with a rounded or conical head. The bark is of a smooth greyish-brown colour. The foliage, when mature, is a dark glossy green; whilst the young shoots and leaves are smooth and light-green in colour. The leaves are ovate, blunt, pointed or rounded, smooth and leathery, and the margin crenate, the petioles being broadly winged. The flowers are produced singly or in cymose clusters, and are sweet scented, the calyx being large and the sepals four or five in number and pointed. The corolla is white, and the petals, four or five, slightly reflexed and fleshy. There are from twenty to twenty-five stamens, the anthers being large and the pistil stout. The stigma is covered with a sticky milky fluid when ripe, and the ovaries number eleven to fourteen.

The fruit is large, oblate, globose, and may be pyriform when from out of season blossom; colour light-lemon to pale-orange; flesh greyish or pink; juice sacs large, spindle shaped and closely packed

together. The flavour is a blending of bitter, sweet and acid; the seeds being large, light coloured, wedge shaped or irregular; and the cotyledons white.

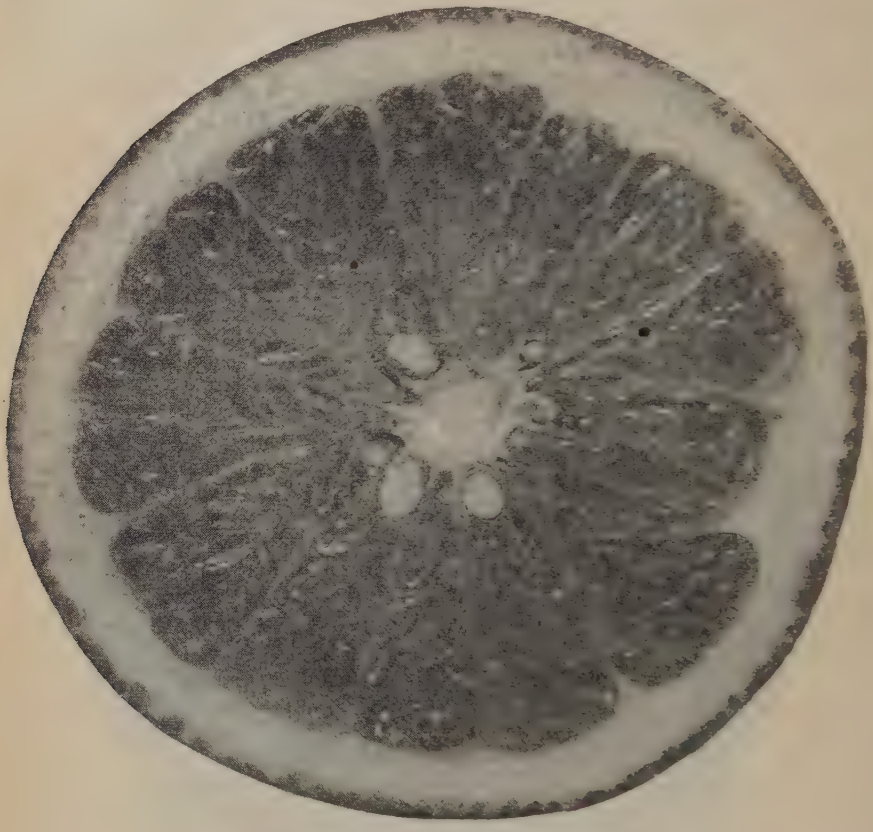


Plate 70.
Cross-section—Marsh Grapefruit.

As a breakfast fruit the pomelo, or grapefruit, is without equal, and in America it is a common and much-sought-after breakfast dish. In Australia, it is not quite so well known, though in the Southern States, and latterly in Queensland, the demand for it is steadily increasing. On the Brisbane market the popularity of this desirable breakfast fruit has been somewhat retarded by the sales of bitter-sweet and sour oranges under the name of grapefruit. This practice is being discouraged, and purchasers are advised to look for a pale-lemon colour in the fruits offered for sale as grapefruit.

Besides being an excellent appetiser, the grapefruit is credited with having tonic properties. The flavour of the ideal fruit is pleasant yet indescribable; and, as previously stated, a blend of bitter, sweet and acid. Lacking this, it falls short of its high standard and can only be classed as inferior.

The bitter principle is contained in the partitions of the fruit. Some connoisseurs contend that it would be better if this were eliminated, and consider that those varieties in which the bitterness is nearly

absent are preferable. It should, however, be realised that without the bitter principle the fruit would not be a pomelo. In quality fruits the bitterness should be rather prominent.

Varieties that have done well in Queensland are:—

Marsh Seedless:—Form oblate; roundish; colour pale lemon-yellow; medium thick rind; smooth; sections thirteen; regular; juice sacs small; flesh greyish-green; flavour good, bitter principle not very pronounced; acidity and sweetness good; seeds none to six, large, plump; midseason.

Plate 71.
Duncan Grapefruit.

Duncan:—Form oblate; colour pale lemon-yellow; rind smooth; sections fourteen; large; bitter principle well-marked; acidity and sweetness good; quality very good; seeds about 50, large, plump, blunt; midseason.

Fosters:—Form oblate; colour pale-yellow; rind smooth; sections thirteen; large; bitter principle strongly marked; acidity and sweetness good; quality very good; flesh pinkish; seeds about 60, large, plump, wedge-shaped or irregular; season early.

Triumph:—Form oblate or oblate oblong, somewhat flattened at base; colour light-yellow; rind very smooth; sections eleven; bitter principle not strongly marked; acidity and sweetness good; seeds 37; medium, plump, roundish; season medium early.

Though Marsh Seedless at present holds pride of place, chiefly on account of its having only a few seeds, the high quality of such varieties as Duncan, Foster, and Myrther, in spite of their seediness, cannot

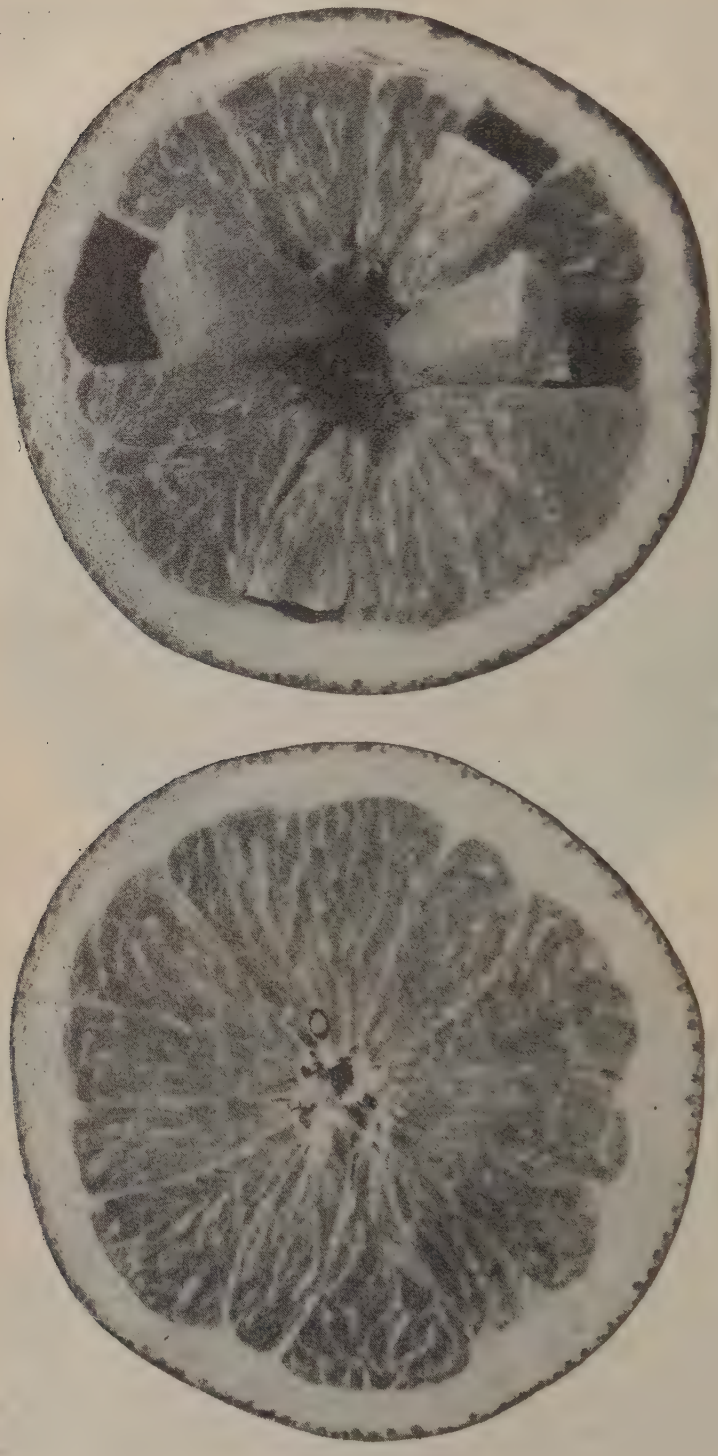


Plate 72.
Preparing a grapefruit for table.

be denied, and they require little, or no greater, trouble to prepare for the table.

Plate 73.
Cross-section—Duncan Grapefruit.

In preparing for the table, bisect the fruit transversely, using a sharp thin-bladed, slightly pointed knife. Secondly, cut round and remove the core, which operation at the same time removes practically all the seeds. Thirdly, from the centre cut outwards down through the partitions which divide the sections. Finally, cut round the partition enclosing the sections and separating the pulp from the rind. Each half of the fruit may then be lightly sprinkled with sugar to taste and placed in the ice chest overnight. Prepared in this manner, the pulp may be readily scooped out and eaten with a spoon.

TO FIREPROOF CANVAS.

The following directions are given in *Successful Farming* (Iowa) for fireproofing canvas, curtains, or similar material:—Mix 1 lb. of ammonium phosphate and 2 lb. of ammonium chloride in 6 quarts of water, and then soak in it the article it is desired to render fireproof. Lightly squeeze out the excess liquid and let the material dry with the ammonium salts in it.

For the more delicate fabrics use 10 oz. of borax and 8 oz. of boric acid dissolved in a gallon of water. Wring very lightly and allow to dry, but do not rinse the material.

The Fruit Market.

JAS. H. GREGORY, Instructor in Fruit Packing.

WINTER marketing conditions are still with us. The month has had, generally speaking, more dull days than usual. This on two occasions caused a sharp decline in fruit values, fortunately only of a temporary nature. The most disappointing feature of the market during the winter has been the poor prices realised for tomatoes. Much of this trouble has been caused through green and poorly matured fruit. The sooner growers realise that artificial colouring methods, to benefit the industry must be used correctly, the sooner will improved prices result. Tests have shown on every occasion the absolute necessity of harvesting none but properly matured fruit. Immature fruit will not colour satisfactorily under any process at present known.

Tests are being conducted by the Department, and progress results should be available by the time these notes are in print. Complaints of green papaws and pineapples are still being received from Southern markets. Following last month's warning the seriousness of this practice is again stressed. The following is a summary of market prices during the latter part of July:—

TROPICAL FRUITS.

Bananas.

Melbourne.—Nines and eights, 23s. to 25s.; sevens, 22s. to 23s.; sixes, 19s. to 21s. Thin, immature lines considerably lower in price, and hard of sale.

Sydney.—Nines and eights, 21s. to 25s. tropical case; sevens, 18s. to 22s.; sixes, 16s. to 19s. Inferior grades considerably lower.

Brisbane.—Nines, 19s. to 22s.; eights, 18s. to 21s. 6d.; sevens, 15s. 6d. to 20s.; sixes, 14s. to 18s. 6d.; smalls, 11s. to 15s.

Lady Fingers, 2d. to 7½d. per dozen.

Pineapples.

Sydney.—Smooths, 7s. to 10s. per case.

Melbourne.—Smooths, 8s. to 10s. Special lines at higher rates. Green fruit hard of sale. Black heart is prevalent.

Brisbane.—Smooths, 4s. 6d. to 7s. case. Loose, 1s. 6d. to 5s. per dozen. Ripleys, 3s. to 5s. case. Loose, 1s. to 3s. 6d. per dozen. Supplies are on the light side and values should be maintained.

Papaws.

Melbourne,—15s. to 18s.

Sydney.—10s. to 14s.

Brisbane.—Yarwuns, 6s. to 9s. per tropical case; Locals, 2s. to 6s. per bushel; Gunalda, 5s. 6d. to 6s.

Complaints of green fruit have been received from all markets. Growers, remember we are in the winter months of marketing!

Custard Apples.

Brisbane.—3s. to 4s. 6d.

Melbourne.—4s. to 6s.

Sydney.—4s. to 6s. 6d.

Some excellent fruit has been on the markets during the season.

Passion Fruit.

Melbourne.—4s. to 7s. per half-bushel.

Sydney.—6s. to 9s.

Brisbane.—Specials to 9s.; firsts, 6s. to 7s. 6d.; seconds, 4s. to 5s. per half bushel.

Avocadoes and Granadillas have not been seen on the market during the month, so no quotes are available.

CITRUS FRUITS.

Mandarins have risen to high levels during the month. Good quality fruit will continue to sell at ruling rates. Oranges had some setbacks due to the dull, wet weather, but as the month closes prices are steady again. Lemons, whilst not returning high values, have remained at a payable level for good lines.

Oranges.

Brisbane.—Navels, 8s. to 10s.; commons, 5s. to 8s.

Sydney.—Navels, 5s. to 9s.; commons, 4s. to 7s.

Melbourne.—Navels, 5s. to 11s.; commons, 3s. to 5s.

Mandarins.

Melbourne.—5s. to 11s.

Sydney.—4s. to 8s.

Brisbane.—Glens, 6s. to 13s.; Special Gayndah, 1s. higher; Emperor, 6s. to 12s.; Scarlet, 5s. to 11s.; Fewtrells, 7s. to 9s.

Grapefruit.

Melbourne.—4s. to 10s.

Sydney.—5s. to 10s.

Brisbane.—5s. to 8s.

Lemons.

Melbourne.—4s. to 9s.

Sydney.—5s. to 8s.

Brisbane.—Gayndah, 6s. to 10s.; locals, 5s. to 7s.; Victorian, 4s. to 7s.

Strawberries.

The dry season has reduced supplies of early berries, but the rains during the last few weeks have caused an increase.

Sydney.—Trays, 3s. to 5s.; boxes, 7s. to 10s. per dozen.

Brisbane.—6s. to 8s. per dozen boxes; choice quality, 9s. to 12s. per dozen boxes.

DECIDUOUS FRUITS.

Apples.

Brisbane Prices.—Jonathan, 6s. to 9s.; Granny Smith, 5s. to 9s., with specials to 10s. per bushel; Sturmer, 5s. to 6s. 6d.; French Crab, 5s. to 6s. 6d.; Democrats, 6s. to 7s.; Rome Beauty, 6s. to 8s.

From now to the end of the season Southern growers should take care to send only carefully selected lines of the larger-sized fruit. Fruit may appear in good condition when it is removed from storage in the South, carry well, and arrive safely on the Brisbane market. The difficulties arise when the Queensland higher temperatures with high humidities are encountered. Again, it must not be forgotten that the country order trade pays the best prices. Fruit bought for this trade often has to travel hundreds of miles before reaching its distributing centre. Growers need have no difficulties if close attention is paid to varieties and sizes. After August only hard, good-carrying types should be sent to Queensland. Rome Beauty, Statesman, Sturmer, and large-sized Jonathan are risky types of fruit to send.

Pears.

Winter Coles, 8s. to 14s.; Josephine, 9s. to 13s.; Broom Park, 6s. to 8s.; Parkhams, 6s. to 9s. The necessity of wrapping all lines of pears is pointed out. Unwrapped lines soon become specky.

OTHER FRUITS AND VEGETABLES.

Cape Gooseberries.

Brisbane.—6d. to 7d. per lb.

Tomatoes.

Brisbane.—Green, 1s. 6d. to 3s.; ripe, 1s. to 2s. 6d.; coloured, 2s. to 4s.

Poor attempts at artificial colouring are the main cause of price discrepancies. Good, full, healthy-looking coloured fruit still maintains the high values. This can only be achieved by using matured fruit for colouring purposes.

Sydney.—2s. 6d. to 4s.; specials, coloured, 5s.

Melbourne.—Queensland, 4s. to 6s.; Western Australian, 7s. to 10s.

Cucumbers.

Sydney.—7s. to 10s. bushel case.

Lettuce.

Brisbane.—1s. to 1s. 6d. per dozen.

Beans.

Brisbane.—9s. to 12s. per bag.

Peas.

Brisbane.—4s. to 6s. per bag.

Pumpkins.

Brisbane.—4s. to 5s. per bag.

Publications.

Booklets on strawberry packing and banana packing are now available on application to the Under Secretary, Department of Agriculture and Stock.

In Memoriam.

WILLIAM REDPATH BENNETT.

Plate 74.

WIDESPREAD regret was felt among his colleagues of the Department of Agriculture and Stock, as well as among large sections of the general public, at the news of the death of Mr. William Redpath Bennett on 30th June.

Mr. Bennett was born at Gateshead-on-Tyne, England, on 3rd May, 1883, and arrived in Queensland in February, 1913. He was appointed an inspector under the Diseases in Plants Act, administered by the Department of Agriculture and Stock, on 1st August, 1916, and, for the greater part of his time in subsequent years, was engaged as a fruit inspector. Although handicapped by deafness, Mr. Bennett at all times was a courteous and capable officer, and his kindly nature gained him the respect and regard of all with whom he came into contact either officially or in his private capacity.

Mr. Bennett's mortal remains were laid to rest at the Lutwyche cemetery on 1st July, after a church service at Windsor, which was attended by the Minister for Agriculture and Stock (the Hon. Frank W. Bulcock), the Under Secretary for Agriculture and the Director of Marketing (Mr. E. Graham), and a representative gathering of officers of the department, fruit merchants, and many others.

To his sorrowing widow and other relatives, deepest sympathy is extended.

Lime-spreading Machinery.*

H. W. KERR.

IT is now well-recognised that most of the alluvial soils of North Queensland, as well as certain areas of other classes of soils in these parts, are in need of regular lime applications to destroy the acidity which develops under conditions of high rainfall, and which acts detrimentally to the growth of the cane crop.

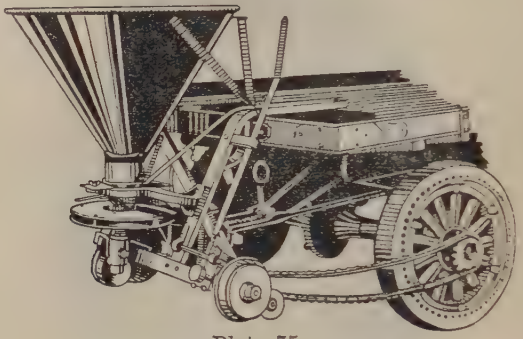


Plate 75.
Broadcaster Mounted on Motor Truck.

With the realisation of this need, attention has also been given to means by which lime may be spread speedily, evenly, and cheaply. This is particularly the case where the use of burnt lime is desired. This material is very disagreeable to handle, owing to its caustic nature, and the double handling which is necessary, where it is dumped in small heaps to slake before spreading, adds to the costs of application. Now that pulverised burnt lime is readily available, the use of a lime spreader becomes possible with any of the several forms of lime.

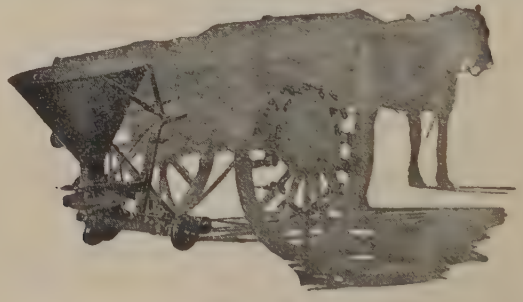


Plate 76.
Broadcaster Mounted on Dray.

The usual form of spreader employed by certain northern growers is the well-known hopper mounted on wheels, and by means of the mechanism which it contains the lime is delivered through small feed drills set in the bottom of the hopper. The amount delivered can usually be adjusted over a fairly wide range.

Another type of lime-spreader, which can be accommodated for use with standard farm vehicles, might appeal to those growers who do not

*From *The Cane Growers' Quarterly Bulletin* (Bureau of Sugar Experiment Stations), July, 1937.

feel disposed to purchase a more expensive unit which can be employed for lime spreading only. Several forms of this Australian-made equipment are shown in the accompanying illustrations (plates 73-76). The essentials of the unit may be attached quickly to a dray, wagon, or motor truck. The dumping of the lime on the headland and its transfer to the lime-spreader are thus avoided, as the lime may be spread directly from the vehicle which transports the material from the railway truck.

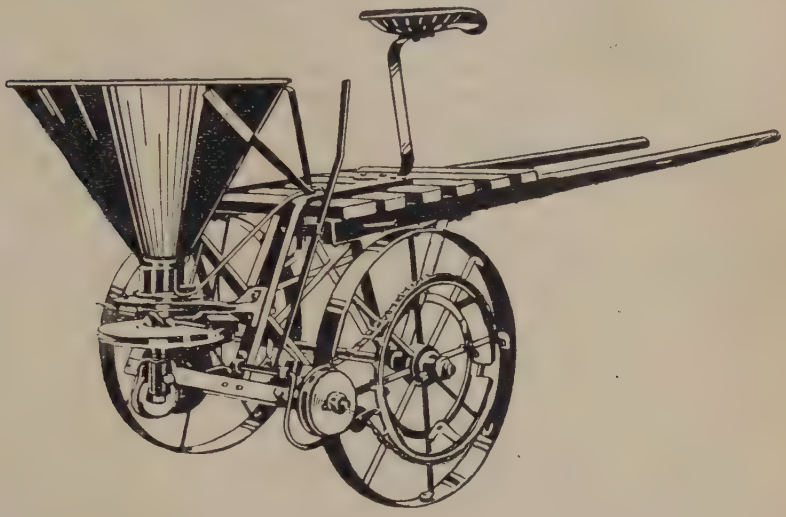


Plate 77.
Broadcaster Mounted on Steel Wheel Sulky.

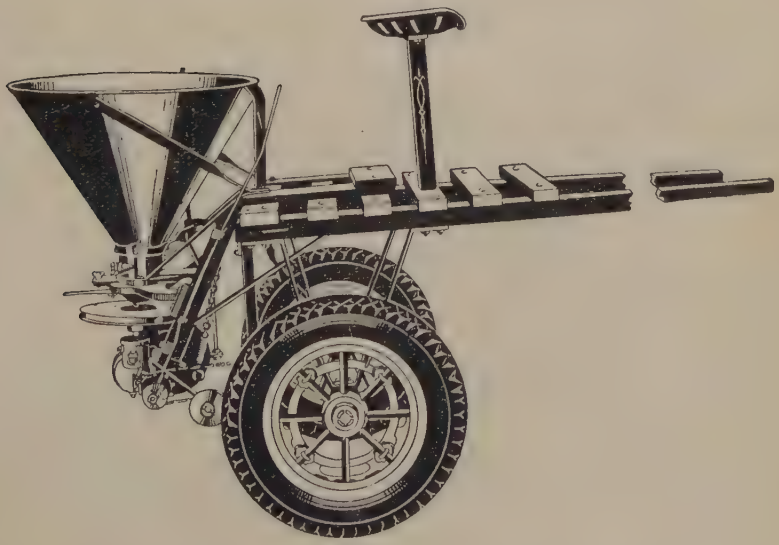


Plate 78.
Broadcaster Mounted on Sulky with Pneumatic Tyres.

It is claimed by the manufacturers that the spreader is of robust construction, and the lime may be spread over a strip 18 to 20 feet wide.

This obviates the necessity for driving close to fences or other obstructions. The range of application varies from less than a hundredweight (when broadcasting superphosphate for example) to a ton or more where this is desired. Areas of up to 250 acres per day have been covered, with a motor lorry attachment, when pastures were top-dressed with superphosphate. The correct size of chain and sprocket is supplied, in these circumstances, for the particular make of truck being used. It is stated that the gears are totally enclosed in an oil bath, so as to eliminate wear from dust and grit. The one serious objection to this type of broadcaster might be the difficulty of spreading very fine lime in windy weather. However, the spreading of normal crushed lime should not present this difficulty, and for fine powdery material the work would be confined to the early morning hours.

The approximate weight of the attachment for wagon, dray, or truck is 3 cwt., while the complete unit on wheels—either steel or pneumatic tyres—is 6 cwt.

Any grower desirous of obtaining further details regarding these machines should communicate with the Director, Bureau of Sugar Experiment Stations, Brisbane, who will put him in touch with the manufacturers.

IN THE CITRUS ORCHARD.

Abnormally dry seasonal conditions have not only resulted in light crops, but have affected tree growth adversely. Every endeavour therefore should be made to effect an early cleaning up of orchards and to afford the trees an opportunity to put out healthy, vigorous growth and blossom in the spring.

In the younger orchards, where well-developed frameworks have been maintained, the usual pruning, such as the removal of suckers and decadent first-fruiting shoots, should be carried out.

In the older orchards, the lack of vigorous healthy fruiting wood has become more pronounced. This condition points to the necessity for a rather severe thinning-out, and, at the same time, a shortening back of terminal growth and twigs. The cuts should be made right back to strong growths; weak shoots and those that have borne fruit should be removed. The thinning leaves spaces for subdivision, while the shortening back tends to force into growth dormant buds from behind. At the same time, it stops an excessive growth of branches and renews supplies of fruiting wood. In cases in which crowding is evident, the removal of entire branches is desirable. The entry of plenty of light and air assists the growth of healthy and vigorous shoots which make new fruiting wood. Any excessive growth of suckers or water shoots arising well inside the tree as a result of heavy pruning needs to be cut away, or it will crowd the centre of the tree.

In older trees, where vitality has been impaired, provision will need to be made for the removal of old, crowded, and decadent limbs. In such instances the pruning is much heavier than usual, necessitating the removal of entire branches. Such branches should be cut right back to their source of origin, so that the sap will be readily diverted to the remaining limbs and encourage the formation of new fruiting wood. Under no circumstances whatever should stubbing be resorted to. In instances where it is necessary to replace larger limbs, the work should be done gradually over two or more years in order to avoid excessive suckering.

Lower branches of trees should not be allowed to touch the ground, as fruit borne on such branches is generally blemished and of poor quality. On the other hand, trees should not be pruned too high from the ground. The height to which they should be lifted varies according to circumstances, but in most instances knee-height will be satisfactory.

R. L. Prest.

Rat Investigation.*

W. A. McDOUGALL.

AT this conference last year a progress report on rat investigations was presented. Actually that report, compiled after a short time in the field and on the advice and writings of men eminent and experienced in this line of work, set out in a general way the proposed method of attacking our rat problem. During the past year no good reasons have come to our notice (either from the results of the work of others or from our own experiments) which warrant materially altering the original programme. It has been persevered with and advanced as far as possible under somewhat adverse conditions. References to the chief of these conditions, i.e., the abatement of the epidemic of 1934-35, will be made here and there in this report and they will partially cover several of the points mentioned or inferred in last year's report.

During June-September last year a brief survey of mill areas north of Townsville (Mourilyan and Goondi partially excepted), the Burdekin, and the Central Districts, showed the house rat, the field rat, and the khaki, tree, or "Melomys" rat to be present in all of them. However, all these mill areas with one exception (the Central Districts), and irrespective of whether systematic or sporadic poisoning campaigns had been carried out, suffered comparatively light rat damage last year. In these circumstances it is not possible to state definitely the rat or rats responsible for the severe damage during past epidemics in all the districts mentioned above, but field observations and cage experiments indicate that the field rat is by far the most important. So far this rat, without variations, has been found to exist only along the coast from Mackay to some miles north of Mossman. Within this area its full distribution is not known. Past damage to cane tends to connect it, at least superficially, with coastal rivers and creeks. It is also present in the higher and well-grassed portions of marine swamps, and in some districts it damages cane high up on hill sides and against "scrub." In some districts against scrub is the chief locality of damage. So far as is known the common scrub rat of the coastal districts (*Rattus assimilis* and its varieties which extend throughout Eastern Australia) does not eat cane and the field rat does not enter scrub. To date most of the heavy damage in cane against scrub in the Central Districts shows both the field and khaki rats to be present. The khaki rat has a comparatively wide distribution, and the conditions under which it exists vary considerably.

In the furtherance of the subject of rat distribution and as an indication of the lines along which our efforts at control are directed there is a fundamental idea which could be expressed at this juncture. This idea or fact is very well put in the writings of a man who is probably one of the most eminent and experienced authorities on ecology and rodent plagues, as follows†:—

> "it is a familiar fact that serious plagues of mice, rats, and other rodents occur from time to time in various parts of the world, often causing a great deal of damage. Readers of Mr. Elton's book will discover that these violent outbreaks are but special cases of a regular phenomenon of periodicity in numbers

* Address to the Pests Boards Conference, held at Meringa, 13th May, 1937, and reprinted from *The Cane Growers' Quarterly Bulletin* (Bureau of Sugar Experiment Stations), July, 1937.

† From the Editor's Introduction by Julian S. Huxley to "Animal Ecology" by Charles Elton, 1935.

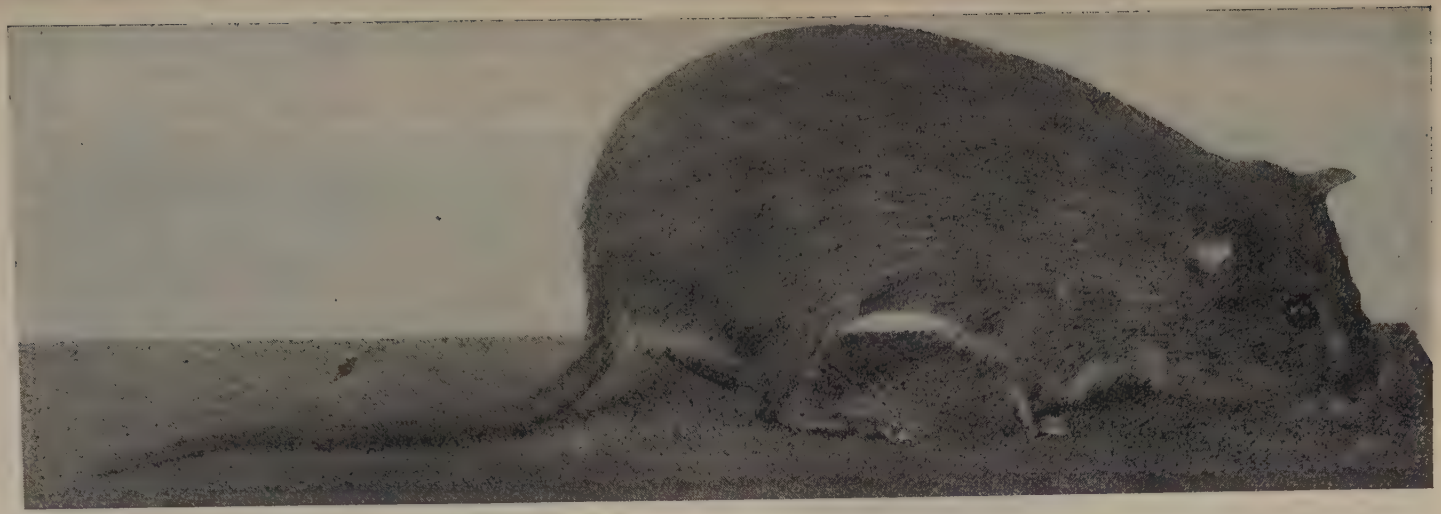
which is perfectly normal for many of the smaller mammals. The animals favoured by climatic conditions embark on reproduction above the mean, outrun the constable of their enemies, become extremely abundant, are attacked by an epidemic, and suddenly become reduced again to numbers far below the mean. When such a number-maximum is so accentuated as to become a plague remedial measures are called for locally, and large sums of money may be spent. Eventually the normal epidemic breaks out and the plague abates. The organisers of the anti-rodent campaign claim the disappearance of the pest as a victory for their methods. In reality, however, it appears that this disappearance is always due to natural causes, namely, the outbreak of some epidemic; and the killing of the animals by man has either had no effect upon the natural course of events, or has delayed the crisis with the inevitable effect of maintaining the plague for a longer period than would otherwise have been the case. In the latter event, it would actually have been a better counter measure to do nothing at all than to spend time and money in fruitless killing. If remedial measures are to be desired, they should be of some special sort. Either they must encourage the development of the epidemic, as by introducing infection amongst the wild population of the pest species; or they may aim at reducing reproduction . . . . ; or they must be aimed at the general ecological status of the species, making it more difficult for it to live and reproduce . . . ."

It cannot be expected, nor would it be wise, if those of us who have to conduct campaigns with the often tried and varied conventional methods at our command were convinced of the truth of the above inference, that the methods should be dropped and nothing done. On the other hand, it should not be expected that a research officer will dodge an unpleasant and unpopular fact and go along the well-beaten track thereby deluding himself and others, when there may be possibilities in other directions. This more or less explains our interest in rat distribution, rat behaviour, populations, and breeding under different conditions. During the past year some preliminary work on these subjects has been done. None of it, as yet, is conclusive. Also it is too early to report on the sick rats (and dead ones found above ground) which have been taken in the Central District (no baits present) since October last.

Whilst always bearing in mind that plague conditions and light sporadic infestations might well be treated separately, some poison experiments have been carried out, some attempts at population estimates have been made, and a preliminary investigation of deterrent sprays has been commenced. The results of all these experiments were unsatisfactory—in fact they may be placed, with a large percentage of all rodent work, under the heading of experience and not scientific experimentation.

For the possible use of field men the minimum lethal doses of all the common oral rat poisons, combinations of them and some others should be completed by the end of this year.

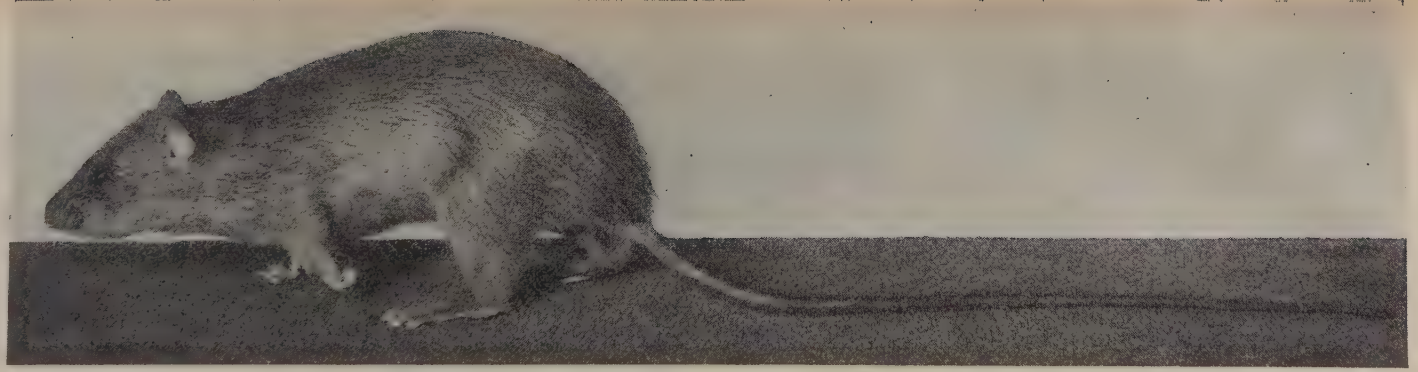
As this report has been written primarily for the purpose of opening discussion on the subject of rat control no detail has been given and it may be concluded with paragraphs on varieties and rat control work being done in other countries.



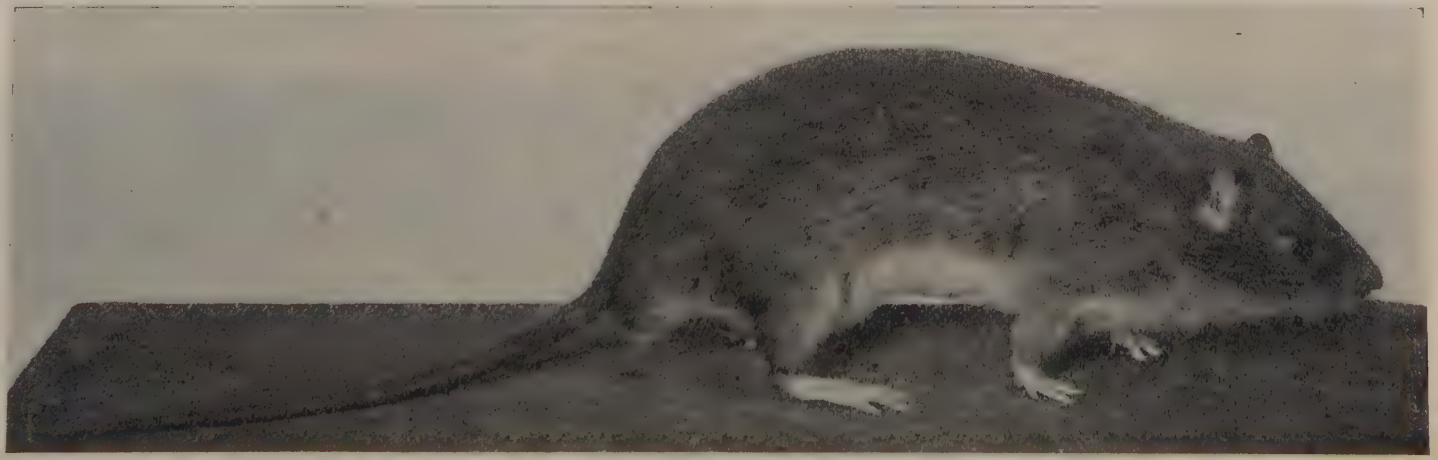
a. Rattus culmorum or the Field Rat (¾ natural size).

b. Mellomys littoralis or the Khaki Rat (¾ natural size).

PLATE 79.—The Feld rat and the Khaki rat, the two species chiefly responsible for damage to cane in Queensland canefields.



a. Rattus rattus or the House Rat (½ natural size).



b. Rattus norvegicus, the Brown or Sewer Rat (½ natural size).

PLATE 80.—The House rat and the Ship rat are chiefly responsible for damage around stables and farm houses and in towns. The House rat occasionally damages cane but is not a serious pest in the canefields. The Brown rat, although present in some sugar towns, has not been found in Queensland canefields.

It has been found that any variety of cane may, at times, be severely damaged by rats. The extent of damage depends, amongst other factors, upon rat population, the conditions under which the rats are present in the cane, and the ability of the variety to stand up to rat attack. For example: in rat country in Central Queensland P.O.J. 213 is a badly-damaged variety. It provides excellent cover, its thin barrel will not stand up to many "feeds," and it is soft. Badila, Co. 290, P.O.J. 2725, and Clark's Seedling all provide rat food which is readily accepted by the pests. Fields of P.O.J. 2714 and E.K. 28 where misses were planted up with Clark's Seedling have been inspected. Nearly every such stool was found to be badly rat eaten whilst the others were left alone. Farms where flooding is not experienced and where fields of Badila and P.O.J. 2878 are grown have shown the former to be severely rat damaged and the latter to be comparatively free of bites. On the other hand, P.O.J. 2714, E.K. 28, and P.O.J. 2878, grown on the higher patches of marine swamp, have suffered severe damage Standover crops of these varieties are often attacked by rats, as are D. 1135 and Uba either as ratoons, plant, or standover cane.

As may be known to many of us, at the present time an extensive rat control research programme is under way in the Hawaiian Islands. No doubt in the near future, particularly if another plague soon comes along, we in this country may hear more of hambergers, and rolled oats, &c., as bases for baits. An attempt is also to be made there to learn something of the life history, &c., of the rat with which they are dealing. A comparison of this work with our own along similar lines should be interesting and useful. In several other countries attempted control of the house rat by new materials is in progress. Although not applicable to our field conditions the use of fumigation by "smoke" in parts of India could be noted.

PREPARING LAND FOR SPRING PLANTING OF PINEAPPLES.

The early preparation of land for the spring planting of pineapples is desirable, and areas to be planted should be ploughed now, as deeply as the implements available and the depth of the surface soil will permit. If possible, this ploughing should be followed by at least one subsoiling to a depth of 18 inches. On no account should the subsoil be brought to the surface. The land should be left in the rough for some time, and, later, ploughed and cultivated to a good even tilth. It will then be in good condition for planting at a favourable opportunity in the spring. It should be borne in mind that a stand of pineapples remains in the ground for several years, and consequently deep cultivation must be carried out prior to planting.

Adequate preparation, as suggested, improves both the aeration and moisture-holding capacity of the soil and thus enables root growth to take place under the most favourable conditions. This is most important, since the first few months of the life of a pineapple plantation largely determine its productivity. Furthermore, as has been demonstrated convincingly, vigorously growing plants are highly resistant to disease.

W. G. Hancock.

Branding and Earmarking of Stock.

H. S. ILIFF, Deputy Registrar of Brands.

THE following particulars regarding the branding of stock and the earmarking of cattle and sheep may be of interest to stockowners who are not clear as to the requirements of the Brands Acts and Regulations:—

The branding or earmarking of stock is not compulsory in Queensland; but, if either is used, only brands and earmarks registered under the Brands Acts will be permitted.

Registered brands or earmarks are not necessary in the case of tattoo brands, pig brands, paint brands on cattle or horses (for temporary identification purposes), age numerals, or stud and herd book numbers imprinted below a registered brand at the first branding.

A brand may be used without an earmark, but an earmark may be used only on cattle carrying the owner's brand with which the earmark is registered.

In earmarking, the marks must be made on the portions of the ear or ears indicated in the registration certificate. The use of a knife for earmarking is illegal.

BRANDING.

Horse and cattle brands may be used in any part of Queensland, but earmarks are issued for use in specified districts and may be used only in the district for which the earmark is registered. Only the full brand can be used, and the owner may imprint the first brand on his cattle upon any one of the following positions:—

First position—neck.

Second position—rump, hip, or thigh.

Third position—ribs.

Fourth position—shoulder or top of arm.

The first brand on a horse may be put on any one of the following positions:—

First position—"near shoulder."

Second position—"off shoulder."

Third position—"near quarter" or "near thigh."

Fourth position—"off quarter" or "off thigh."

Fifth position—"near ribs."

Sixth position—"off ribs."

(The "off" side is the right-hand side and the "near" side is the left-hand side in all stock.)

The owner of a symbol horse and cattle brand may use the symbol brand either in addition to or instead of the three-piece brand with which the symbol is registered.

In the case of first brandings, the symbol brand may be imprinted upon either cheek of stock, but any second or subsequent branding must, if there is sufficient space, be placed at a distance of not less than 1½ inches nor more than 2½ inches from, and directly underneath, the

previous brand imprinted on the stock. If there is insufficient space underneath the previous brand, rebranding must be done on the next position. If, for instance, the previous brand is on the fourth position in the case of cattle, or on the sixth position in the case of horses, and there is not sufficient room for a new brand on those positions, the rebranding must be done on the first position—the neck in the case of cattle, and the near shoulder in the case of horses.

It is important to note that when a second or any subsequent brand is imprinted on cattle, it must be placed on the same side of the beast as the immediately preceding brand. The branding of cattle is thus confined to one side.

(Symbol brand owners may have a special position allotted upon which to rebrand purchased horses and cattle.)

The penalty for a breach of these rules of branding is £50.

In the case of first brandings, an owner is entitled to select any one of the positions here specified.

The size of branding irons is restricted to not less than 1¼ inches in length or more than 3½ inches in length for horses and cattle.

Fully grown stock may be branded with a brand not less than 1¼ inches in length or more than 5 inches in length.

EARMARKING.

It is illegal to earmark cattle which have been previously earmarked, or to put any unregistered mark or cut of any kind upon the ears of cattle.

Purchased stock with two full ears may be earmarked provided they are first rebranded with the owner's brand with which the earmark is registered.

Earmarking for distinctive purposes, such as to denote speying, inoculation, &c., is illegal.

The dewlap mark may be used for any distinctive purpose, but it is not registered or recognised by the Department.

Distinctive brands, for use on the cheek of cattle or horses, may be registered without fee, to denote age, class, inoculation, speying, &c. These cheek brands may be used only on stock bearing the owner's registered three-piece brand.

The breeder or first brander may imprint numerals under his registered brand for stud or herd book reference or to denote the age of his horses or cattle.

The removal of more than one-third of the ear of any stock in earmarking is illegal.

SHEEP BRANDS AND MARKS.

Sheep earmarks may be used without a sheep paint brand or fire brand, or *vice versa*. All registered sheep earmarks must be made on the "near ear" of female sheep, goats, or swine, and on the "off ear" of male animals.

When sheep have been earmarked with a registered mark, it is illegal to earmark them again on the "registered ear." Distinctive marks to denote the age, class, &c., must be imprinted on the "off ear" of female animals and on the "near ear" of males.

These marks are not registered, but no distinctive marks may be used which are similar to any registered earmark used in the same locality.

Earmarks, paint brands, and fire brands must be used on the positions for which they are registered and as shown on the certificate of registration.

As in the case of cattle earmarks, the use of a knife for earmarking sheep is illegal, and pliers must be used. There are no exceptions to this rule.

In the event of the death of the owner of any brand or earmark, it is necessary to have a transfer of the brand or mark into the name of the person who wishes to make use of them. All owners of brands or earmarks should notify the Department of any change of address.

The alteration of address is published in the next issue of the *Government Gazette*, and is a protection to the owner in the event of any of his stock straying or being impounded.

The fees for the registration and transfer of brands and earmarks are as follows:—

	£	s.	d.
Registration of a horse and cattle brand ..	1	0	0
Registration of a horse and cattle symbol brand	7	10	0
Re-registration of a cancelled horse and cattle brand	3	0	0
Registration of a cattle earmark	1	0	0
Transfer of a horse and cattle brand		10	0
Sheep Brands and Marks.			
Registration of a sheep paint or fire brand ..		5	0
Registration of a sheep symbol brand ..	3	0	0
Registration of a sheep earmark		10	0
Transfer of a sheep brand and earmark ..		5	0

SEED POTATO SELECTION.

The problem of obtaining suitable seed potatoes for the early crop confronts most growers every year. This seed must necessarily come from southern sources, and, although the regulations demand that the bags must clearly bear the name of the variety, attention is called to the risk of buying seed of inferior quality. On most farms, it is a common practice to grade out all undersized tubers and sell them as seed. This means that the weakest and least prolific strains of the variety are included and the risk of a poor return is obvious. Much can be said in favour of purchasing larger potatoes and cutting them into sets, as this largely eliminates the danger of rubbish being planted.

It is false economy to cut the sets too small, as they serve as a reserve food supply for the plant during the early stages of its growth. Small sets soon become exhausted and the growing plant fails to receive the necessary assistance. This check hinders normal growth and handicaps the plants in the formation of tubers. Sets should not be allowed to dry out more than can be helped before planting.

For the late crop, round seed is recommended and most growers manage to reserve their own requirements. The practice of selecting this seed at the time of harvesting from the most prolific plants is well worth the extra trouble.

A. F. Skinner.

The Present Situation Regarding the Giant American Toad in Queensland.*

By H. JACOBSON, F.E.S.

DOUBTLESS all readers will no doubt remember that during the last conference we were labouring under a ban imposed by the Federal Government which restricted the introduction of toads to the Centre Territory, Innisfail, and Tully districts. While the ban gave us the opportunity to plant up those districts in great detail, it afforded rather harshly those districts where grub damage was not sufficiently widespread and serious to warrant the first load (Bundaberg being quite clear, but where nevertheless grubs were serious in localised areas. Dropped on these areas subsequently found themselves in the position of finding a limitation of toads, while it was impossible to liberate any to help areas by virtue of the existence of this ban.

Accordingly we took the matter up further with the Federal Health Department who are responsible for the administration of the quarantine laws. After analysing the records of toads collected in this district under a variety of conditions and dissecting a number of toads caught similarly, we presented to the Health Department the details of what they had asked, with the result that the ban was finally lifted in September of last year. Since very much has been learned as the Mission Beach, Innisfail, Logan, Beenleigh, Cape Bay, Bunker Bundaberg and Isis districts.

It is pleasing to note that the first Australian-bred generation have commenced breeding, and tadpoles are very plentiful in areas where the toads were originally liberated. Egg strings can occasionally be found in the pools along the Little Mulgrave, whilst the same pools harbour thousands of tadpoles. Breeding has been taking place there continuously since last December. Thousands of breeding have been found also in the Mulgrave, Russell-Mulgrave, and Innisfail districts, and toad populations in these places will soon take a sudden rise. We have, therefore, determined liberations in those districts even since reads from the last liberations become negligible, as any further liberations at this juncture would but add appreciably to the already existing populations there. We plan to continue extensive liberations in the central and southern districts for some time, as that being more accustomed to cane populations in those areas there should be no need to make further liberations there next year.

With regard to the usefulness of toads against the Greyback beetle pest, it is much too early to judge their efficacy yet. Certainly they could have had very little or no influence on the beetle pest last year because during the fighting period the number of mature toads in large which would be capable of eating a Greyback beetle would then be too small. However, it is possible that during the coming year, in localised areas, we may gain some idea of their possible effect. I refer particularly to the Little Mulgrave area where toad populations are now dense, and the Cairns district where toad populations are now coming to maturity, and where if the grubs are now commencing to recover themselves, and where if the serious check caused thereby is likely to be intensified at the end of this present year.

---

*Presented to the Cane Pests Conference held at Mackay, 1st May, 1935, and reprinted from the Cane Growers' Quarterly Bulletin, Journal of Sugar Experiment Stations, July, 1935.

The Treatment of Horses for Worms.

AT a recent mass meeting of canegrowers held in Nambour, a very interesting address was delivered by Dr. F. H. S. Roberts on the treatment of common ailments of the farm horse. At the request of Mr. W. Kittle, Secretary of the Moreton District Canegrowers' Executive, the following notes were prepared by Dr. Roberts, for the guidance of canegrowers generally:—

Tapeworms.—Starve for 24 hours, then give 2 fluid oz. of turpentine and 1 dram male fern extract in 2 pints of raw linseed oil. Food and water may be given 4 hours after treatment. These dosages are for an animal weighing 1,000 lb. or more and should be reduced for lighter animals.

Stomach Worms.—Starve for 24 hours, then give 2 quarts of a 2 per cent. solution of sodium bicarbonate (baking soda). Thirty minutes after giving this solution, give carbon bisulphide at the rate of 2½ cubic centimetres for every 100 lb. of weight. Food and water may be allowed 4 hours after treatment. The carbon bisulphide is given enclosed in a gelatine capsule as a ball.

Bots and Large Roundworm.—Starve for 24 hours before and for 4 hours after treatment. Give carbon bisulphide at the rate of 2½ cubic centimetres for every 100 lb. of weight in a capsule as a ball. For the large roundworm, the horse may receive, instead of carbon bisulphide, oil of turpentine at the rate of 5½ cubic centimetres for every 100 lb. of weight. The turpentine is mixed with raw linseed oil (1-2 pints according to weight) and given by means of a bottle.

Strongyles or Palisade Worms.—If possible, starve up to 36 hours before and for 4 hours after treatment. Give oil of chenopodium mixed with raw linseed oil. The chenopodium is given at the rate of 1½ cubic centimetres for every 100 lb. of weight. Make sure the linseed oil moves the bowels; if not, give more oil. The chenopodium and linseed oil may be mixed and given with a bottle.

Pin Worms.—Wash out the rectum with an enema of 1-2 gallons of lukewarm water containing 2-4 oz. of sodium bicarbonate. Starve for 36 hours and then give oil of chenopodium as for Palisade Worms.

—*The Cane Growers' Quarterly Bulletin.*

TO SUBSCRIBERS.

Kindly renew your subscription without delay. Write your full name plainly, preferably in block letters. PLEASE USE THE ORDER FORM, which will be found on the last page of each issue.

Address your subscription to the Under Secretary, Department of Agriculture and Stock, Brisbane.

PRODUCTION RECORDING.

List of cows and heifers officially tested by Officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Books of the Australian Illawarra Shorthorn Society and Jersey Cattle Society, production charts for which were compiled during the month of June, 1937 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter-Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORNS				
MATURE (OVER 5 YEARS), STANDARD 350 LB.				
Model 3rd of Alfa Vale	W. H. Thompson, Nanango	15,782·05	684·399	Reward of Fairfield
SENIOR, 3 YEARS (OVER 3½ YEARS), STANDARD 290 LB.				
College Gold II.	Queensland Agricultural High School and College, Lawes	11,104·45	466·506	Premier of Hillview
SENIOR, 2 YEARS (OVER 2½ YEARS), STANDARD 250 LB.				
College Stately 4th (365 days)	Queensland Agricultural High School and College, Lawes	12,451·54	493·915	College Robin
JUNIOR, 2 YEARS (UNDER 2½ YEARS), STANDARD 230 LB.				
Laguna Fussy	F. G Lamkin, Moola, Dalby	6,964·3	294·598	Morden Marcus
Trevor Hill Twinkle	Geo. Gwynne, Umbiram	7,274·31	263·104	North Glen Emblem
Trevor Hill Nectar	Geo. Gwynne, Umbiram	6,754·44	254·545	North Glen Emblem
JERSEY.				
MATURE (OVER 5 YEARS), STANDARD 350 LB.				
Trecarne Rosella 4th	T. A. Petherick, Lockyer	7,410·27	353·362	Trinity Officer
SENIOR, 2 YEARS (OVER 2½ YEARS), STANDARD 250 LB.				
Glenmore Bluebell	L. J Comiskey, Warra	5,212·51	289·131	Glenmoore Jolly Jester
JUNIOR, 2 YEARS (UNDER 2½ YEARS), STANDARD 230 LB.				
Kathleigh Glory	J. Goostrey, Landsborough	6,037·45	314·749	Retford Royal Atavist
Maurfield Larkspur's Dewdrop	F. Maurer, Darra	4,993·55	280·648	Prospect Monto
Lorine of Calton	D. R. Hutton, Bellgarth, Cunningham	5,235	270·952	Retfords Glory King II.

Forestry in Queensland.

[*Photo: J. A. Lunn, Survey Office.*

Plate 81.

A THINNED-OUT CYPRESS PINE STAND NEAR BARAKULA.—Natural regeneration and thinning operations by the Field Staff of the Queensland Forest Service have greatly increased the growth and improved the stand in our hardwood and cypress pine forests.

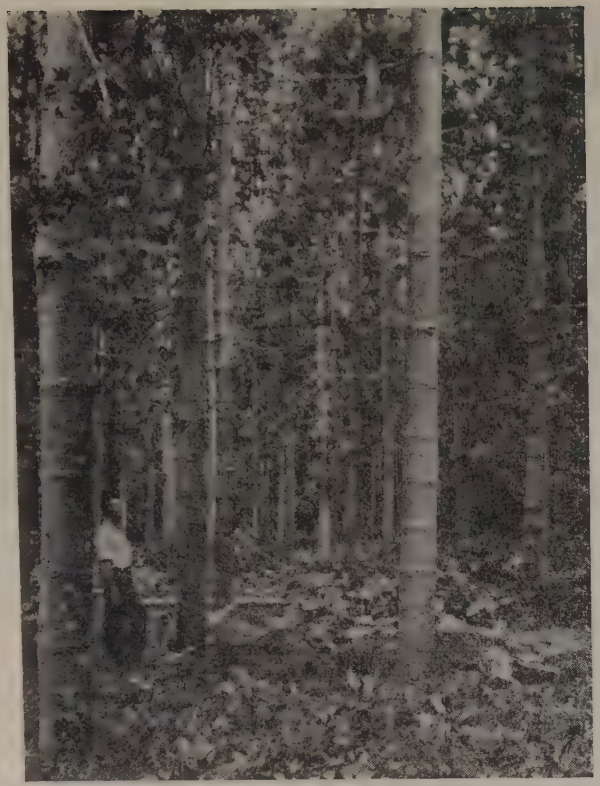


Plate 82.

A TWENTY-YEAR-OLD STAND OF KAURI PINE AT BARRON, NORTH QUEENSLAND.

[*Photos: Queensland Forest Service.*

Plate 83.

SLASH PINE PLANTATION AT BARRON.

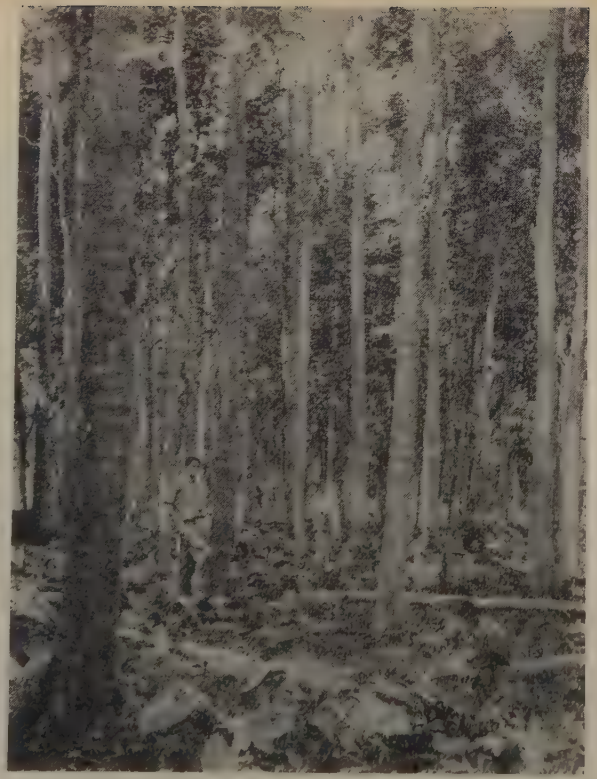


Plate 84.

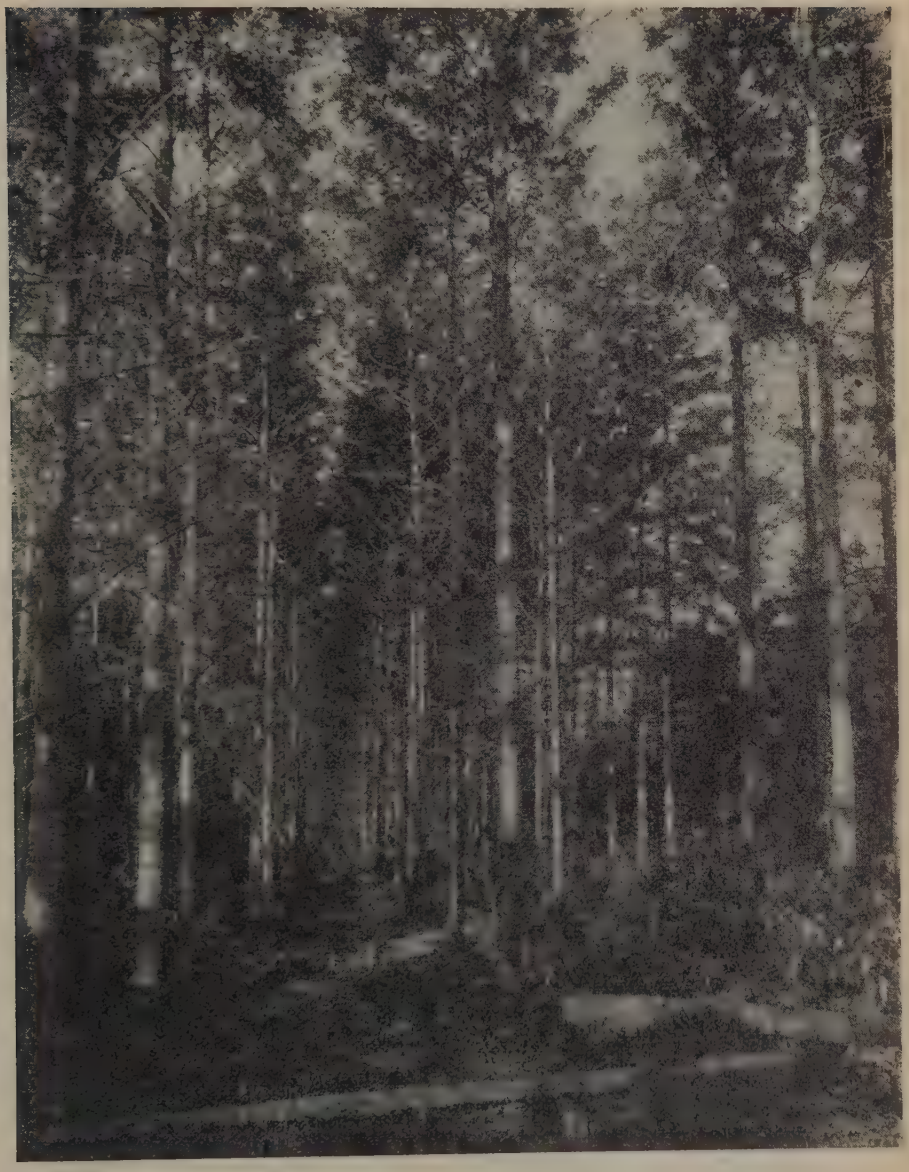
A PLANTATION OF RED CEDAR AT BARRON.

[*Photos*: *Queensland Forest Service.*

Plate 85.

A SEVEN-YEAR-OLD MAPLE PLANTATION AT GADGARRA, NORTH QUEENSLAND.

Hoop pine is most used by the Queensland Forest Service in its plantation work, but other valuable indigenous softwoods and cabinet woods are also included in forestry operations.



[*Photo*: *Queensland Forest Service.*

Plate 86.

A 10-Year-old Silky Oak Stand at Colinton, Brisbane Valley.—The total area of forest plantations in Queensland is now about 20,000 acres. Every year the acreage is increased. State forest reserves, which already cover an immense area in the aggregate, are being extended also in every timber region in which the conditions and requirements of land settlement permit.

[*Photo*: "*Telegraph*" *Newspaper Company Limited.*

Plate 87.

NATURAL REGENERATION IN A BLACKBUTT FOREST.—The thinning was done by a party of youths working under the Juvenile Employment Scheme instituted by the Queensland Government.

Plate 88.

SNIGGING HARDWOOD LOGS WITH A CATERPILLAR TRACTOR, MAPLETON STATE FOREST.—Over 22 million super feet of hardwood logs are sold annually from Crown forests. In 1935-36 sales of all kinds of timber from State forests aggregated 148 million super feet.

Plate 89. [*Photo: "Telegraph" Newspaper Coy. Ltd.*

WEALTH FROM QUEENSLAND'S TROPICAL TIMBER LANDS.—Stacking Walnut and Silky Oak logs for shipment at the harbour side at Cairns. An electric crane provides the lifting power.

Plate 90.

Logs from the Rain Forests, Atherton Tableland.—Rafts of Kauri Pine awaiting shipment, Cairns Harbour.

The Tropics and Man

Circulation of the Blood.

DOUGLAS H. K. LEE, M.Sc., M.B., D.T.M., Professor of Physiology, University of Queensland.

Second Series: No. 1.

In the sixteenth century, when the now famous William Harvey proved conclusively that the blood goes round and round the body, time after time, repeating its work over and over again, he was not believed. To-day, every schoolboy knows the way the heart works. If he is a very bright schoolboy, he will probably remember that the left side of the heart pumps bright red blood, full of oxygen, into the arteries; that these arteries take the blood to all parts of the body; that the veins bring darker blood, poor in oxygen, back again to the right side of the heart; and that the right side of the heart pumps it through the lungs, where it takes up oxygen, becomes bright red again, and sends it back to the left side of the heart to commence its trip all over again.

This bright schoolboy will also be able to remember that, not only does the blood pick up oxygen on its trip through the lungs and give it up to the tissues all over the body, but that it also picks up waste matter from these body tissues and takes it away to such organs as the lungs, kidneys, and liver, where these waste materials are taken out and thrown away. Furthermore, pleased at showing off his knowledge, he will describe how food substances are picked up by the blood from the intestines and taken to the tissues which need them, and to store-houses when they are not wanted immediately.

The Work of the Blood.

From the information given us by this bright schoolboy we could lay down some of the important jobs that the blood and the machinery, which sends it round, have to do. Firstly, it has to supply oxygen to all parts of the body; secondly, it has to take waste substances away from all parts; thirdly, it has to supply food to all parts. There are other jobs to be done also, which, although much more subtle and beyond the schoolboy's interest, are equally important. The total amount of certain substances (salts) dissolved in the blood must be just right, not too much of one, or too little of the other. The amounts of acid substances and the amounts of alkaline substances must balance very accurately, so that there is a shade more alkali than acid present. Its temperature must be within certain limits. There must be a certain amount of those substances the chemist calls colloids present and so on.

You see how extraordinarily important and delicate a matter this circulation of the blood is. If it is not pumped to the tissues fast enough, or if it does not contain enough oxygen or food, or if something is wrong with the mixture, then the tissues concerned can no longer work. When, for instance, we do unaccustomed work, our muscles quickly get tired and even painful. The blood supply is not good enough to supply oxygen and remove wastes at the rate required by the active muscles, and they quickly go on strike.

Importance of Circulation in Heat.

You are probably asking why I have spent all this time talking about the blood and what it does, and have said nothing about the tropics, which is what you want to know about. Now there are three systems in the body that are most susceptible to exposure to heat—the nervous system, the ductless glands, and the blood circulation. Moreover, the first two depend a very great deal for their proper working upon the circulation of the blood. If we do not understand how and why the blood circulates, we shall be like the old-time car-owner's wife, who suggested to her begrimed and exasperated husband that he should look and see if the carburettor were short-circuited.

Partial or complete failure of the circulatory system is the commonest cause of chronic or acute distress from exposure to heat. As we might expect, the nervous system is by far the most delicate system in the body, and has the greatest opportunity for making its distress evident. This is a most fortunate circumstance, in that warning signals are displayed at a very early stage. These are usually heeded. Lassitude, dull headache, inability to concentrate are well-known effects of hot days. If they are ignored, attention is usually forced to them, even if fainting is necessary. The body is not permitted to continue with behaviour which might seriously damage vital tissues. Occasionally people of unduly phlegmatic temperament engaged in occupations not requiring skilled concentration, or people acting under a severe emotional urge, overstep these limits and pay with their lives.

How Heat Affects the Circulation.

How does exposure to hot surroundings affect the circulation so that ill effects are apt to ensue? To deal properly with that question would take us into a fairly long and technical discussion; but I think I can give you a fairly simple idea. When the temperature of the skin is raised, all the myriads of tiny blood vessels in it get bigger. This is partly a direct effect of heat, and partly due to the action of the nervous system on these blood vessels. The purpose of this is to allow more blood to pass more quickly through the skin and allow more heat to be lost from it. So long as only a fairly small proportion of the skin surface is heated, or so long as the heating is only moderate, nothing untoward happens. If, however, the blood vessels of a very large area of skin are very much dilated, then the total volume of the blood vessels in the body is very much increased, and there is not enough blood to fill them.

Now you all must have experienced the sensation of working a pump when there is not enough water or kerosene to fill it. The pump wastes its energy on nothing and a very irregular flow comes out. Something of this nature happens when there is not enough blood to fill the blood vessels. Indeed, the result of enlarging the vessels while the amount of blood remains the same is very much the same as that of taking away a lot of blood while the vessels remain the same size, and everyone knows what happens when one loses a lot of blood.

Results of Circulatory Inefficiency.

When there is not enough blood to fill the blood vessels, many parts of the body begin to suffer from lack of blood supply. All parts do not suffer to the same extent since some tissues are much less particular

about this than others. Moreover, people vary a good deal in these matters; so that, while one man complains of drowsiness, another complains of indigestion, and a third of fatigued muscles. The symptoms displayed by a deprived nervous system I have mentioned—lassitude, irritability, drowsiness, lack of concentration, dull headaches, and, eventually, fainting. The digestive system signals its protest by loss of appetite (although a certain amount of this is desirable), a feeling of sickness, the vague discomforts we speak of as indigestion or constipation. The feeling of intense muscular fatigue is partly due to loss of nervous power, but partly also to direct muscular protest against a poor blood supply.

Prevention and Cure.

Training is the great factor in preventing circulatory distress. Of course, there are conditions which no self-respecting system can be asked to endure; but, in general, the circulation can be trained to a remarkable degree, as is evidenced by the tremendous feats of well-trained athletes. Common sense is the great principle in training, which dictates a continual but gradual increase of the demand upon the individual adjusted to the individual's response.

Avoidance of all abuse and excess—including the excess of cutting out everything—is essential. Categorically to forbid all popular pleasures is as detrimental as sanctioning unbridled indulgence.

The use of a good mixed diet, a liberal addition of salt, and the drinking of as much plain fluid as is desired go a long way toward helping the circulatory system in its job.

WIND BREAKS FOR BANANAS.

During the recent cold snap, the desirability of retaining suitable windbreaks around banana plantations has been indicated by the number of plantations which have been frosted.

As growers are now falling scrub to plant fresh areas, the necessity of retaining a belt of scrub about 2 chains wide around new areas cannot be too strongly stressed. Where the ground is definitely liable to frosting, it is a good plan to make the track through the scrub or forest into the plantation on a zigzag formation. In areas not liable to frosting, a windbreak will greatly assist in keeping out cold winds which chill the plants and thus retard their growth.

Where plantations are already established, growers should give attention to the planting of windbreaks, of which two types are easily made. Lady's Finger or Sugar bananas planted in close formation round the plantation will produce a thicket, and so afford protection. Several border rows of Java cane will also give some protection against frost and wind.

Growers should remember that too much hard work is put into falling scrub, burning off, logging up, and planting areas to excuse the neglect of reasonable precautions against the possible damage to bananas from frost or cold winds, for one severe frosting followed by a warm day will render their plantations worthless.

W. E. Hamley.

Answers to Correspondents

BOTANY.

Replies selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.

Para Grass.

A.M. (Townsville)—

The specimen is *Brachiaria mutica*, the Para grass, better known in Queensland as *Panicum muticum*. There is no doubt about the palatability and valuable qualities of this grass as a pasture, and for growing in many parts of coastal Queensland in wet places or under cultivation, it is one of the best species that could be planted. It sets very little fertile seed, but it may be propagated easily by cuttings, which root readily and, during the wet season, grow very rapidly.

Bindweed.

A.W. (Kulgun)—

The sample sent by you represents the Bindweed, *Convolvulus arvensis*. This is a native of Europe, now naturalized as a weed in most temperate countries. It is an exceedingly bad weed-pest in the Southern States in Europe, and in North America. It has made its appearance in Queensland on different occasions, but does not spread here to the same extent as it does further south, and seems to be confined to a few isolated patches.

If the patch is only a small one, it is probably better not to disturb the ground, but to cut the green shoots down as they appear. A weak arsenical solution poured into the patch could be tried. It is, generally speaking, better to use a large amount of weak solution, than a small amount of strong. If it is decided to fork the plant out, care should be taken that the underground parts are not carried about, as even a small piece dropped, may develop into a new plant.

Pigs are fond of both the underground and above-ground growth of Bindweed, and where it is very bad, if the land is ploughed, the pigs will help in removing the underground parts. They have been quite successful for this work in Queensland in the few patches where the weed has made its appearance.

Bristle Poppy.

Inquirer (Jondaryan)—

The specimen forwarded by you bears no flowers, but we should say it is the bristle poppy or spiny poppy (*Papaver aculeatum*), a plant with rather a peculiar distribution, being found in the Eastern Australian States, and in South Africa.

In the Southern States, it is a minor weed-pest, but is not so abundant in Queensland, and so far as we have observed, has not proved itself an aggressive pest.

Valuable Fodder.

F.P. (Maleny)—

Brachiaria mutica, better known in Queensland as *Panicum muticum*, also as Para grass and giant couch, is an excellent, nutritious, and palatable fodder, and a small paddock of it is very useful for periodical feeding off. It does not do particularly well in Southern Queensland in the ordinary pasture, but requires cultivation or rather damp conditions. It is particularly useful for growing along creek banks or in swampy localities. It is frost tender. It is not known to be poisonous or harmful at any stage of its growth. It is propagated from cuttings. The seed, generally speaking, possesses a very low percentage of fertility.

Ivory Wood.

J.H. (Porter's Gap, via Bell)—

The specimen you sent me is the Ivory Wood, *Siphonodon australe*, a native of the drier scrubs of Southern Queensland. The fruits are not known to possess any poisonous properties. They were said to be eaten by the aborigines in the early days, but they always seem to be too hard and woody to be of any value as food.

Wattle and Grasses.

K.E. (Chinchilla)—

The smaller wattle in flower is *Acacia decora*. We have not heard a local name given to it, though it is exceedingly common on parts of the Darling Downs, Maranoa, and Burnett districts. It is certainly very decorative, and the specific name is quite appropriate.

The wattle in flower is *Acacia Cunninghamii*, commonly known in Queensland as black wattle.

The tall oat grass of the Darling Downs is *Themeda avenace*, the genus *Anthistiria* having given way to *Themeda* on the score of priority.

Kangaroo grass is *Themeda australis*.

From your description, we think that Leichhardt's "vitex" must have been the sandal-wood or budda, *Eremophila Mitchellii*. This is certainly very common and rather a beautiful sight when in flower.

Wilga is *Geijera parviflora*. We were very interested in your remarks on the advancement of the brigalow in the Dawson country. We certainly think that the brigalow and mixed soft-wood scrub is the dominant type, and as your informant says, has spread gradually over the plains. We have seen a form of brigalow and mixed scrub in the making.

Serious Menace, Common Weeds.

Inquirer (Toowoomba)—

The European Bindweed, *Convolvulus arvensis*, is one of the worst of the European and North American weeds. It is fairly common in the Southern States. It has appeared in Queensland at different times, and during the past five or six years it has been seen several times as a weed of the Darling Downs, mostly in small patches in cultivation areas. Fortunately, it does not seem to spread here to anything like the extent it does in more temperate places, but it is certainly a very serious menace, and there is no telling when it will spread to a greater extent than it is doing at present.

The only suggestion we can offer is the one you have made, namely, spraying with a weak solution of weedex or other weed spray, each time any fresh growth appears. This will eventually exhaust the underground root stock. It may be advisable to fork the patch over and spray the patch; but, of course, care must be taken that the pieces are not carried from one part of the farm to another as every little piece of the plant dropped, is capable of forming a fresh patch. Mr. W. Deacon, M.L.A., formerly Minister for Lands, told us that he had a few patches of this weed on his farm, and found that pigs were very useful in getting rid of it, being very fond of the white, underground parts. Pigs have been used elsewhere to aid in its eradication; the only thing against it in Queensland is that at present the plant is mostly found in very small patches, and pigs might easily spread it about from one part of the farm to another.

Inquirer (Mareeba)—

Crotalaria sericea is a native of India, but is now a very common weed in Queensland, being found along the coast from Brisbane to the far North. It is a showy, rather attractive plant, and has been suspected on one or two occasions of poisoning stock. Nothing definite, however, is known about it and so far as we have observed, stock seem rarely to eat it in any quantity. Though a fairly abundant weed in parts, we cannot say that it is fairly aggressive or that it calls for particular means of eradication. It is very close, if not conspecific, to a species that has been imported into Queensland, namely *S. spectabilis*.

East Moreton Plants Named.

G.G. (Mount Beppo)—The specimens have been determined as follows:—

1. *Echinochloa Crus-galli*, wild millet. This grass is very closely allied to such well-known cultivated fodders as Japanese millet and white panicum.
2. *Setaria glauca*, a pigeon grass. This grass is closely allied to such well-known cultivated fodders as Manchurian millet and Hungarian millet. It mostly occurs either as a weed of cultivation or in damp pastures.
3. *Eragrostis poecoides*, a species of love grass. The love grasses are very common in Queensland, and, though only of secondary value as fodders, probably play some useful part in the general mixture.
4. *Paspalum dilatatum*, common paspalum.
5. *Eleusine indica*, crowfoot grass. This grass is very widely spread over the sub-tropical and warmer regions of the world. It is very common in Queensland, and mostly occurs as a weed of cultivation. It contains a prussic-acid-yielding glucoside, but very little trouble is experienced from it in Queensland.
6. *Chloris virgata*, feather topped Rhodes grass, or woolly topped Rhodes grass. This grass is very common in many parts of Queensland, and though rather a luscious-looking grass, is not generally eaten by stock to any great extent. They seem to eat it readily enough, however, in the form of hay. This grass has invaded much of the lucerne-growing country of South Queensland, particularly in the Lockyer valley, and has decreased very considerably the earning capacity of some of the lucerne paddocks.
7. *Chloris divaricata*, a star grass. The native star grasses or windmill grasses are mostly good fodders, making good bottom feed, particularly for sheep.
8. *Themeda australis*, kangaroo grass, a very valuable native grass, but does not stand up to heavy stocking.
9. *Chloris gayana*, Rhodes grass.
10. *Eriochloa sp.*, sometimes known as early spring grass in Queensland. They are good fodders, but the local name is not particularly appropriate, as they are not much earlier, or any earlier, than many other native grasses which come up with early summer rains.
11. *Digitaria marginata*, summer grass, a useful fodder, mostly occurs as a weed of cultivation or in rather sandy tracts in the pasture.
12. *Bothriochloa decipiens*, bitter or pitted blue grass. This is an inferior species of blue grass, sometimes called coastal blue grass. It is the dominant species in many pastures, due to the better and more palatable kinds being eaten out.

Some Poison Plants.

J.H.McL. (Kilkivan)—

1. *Solanum seaforthianum*, a native of tropical America, now a common naturalized weed in many scrub areas in Queensland. It belongs to a dangerous family, and the berries have been accused of poisoning children, though not fatally and of poisoning poultry. So far as we have observed, stock rarely touch the plant, as it has a rather nauseating flavour. We should say, however, that it would be decidedly unwholesome.
2. *Solanum nigrum*, black night shade. The ripe berries of this plant are frequently eaten by children without any ill effects following, but the green berries and green parts generally contain a poisonous principle solanin, which tends to disappear in the ripe fruits. The green parts of this plant are poisonous, but rarely seem to be eaten by larger stock such as cattle in sufficient quantities to cause trouble.
3. *Rivina laevis*, a very common weed in many scrub areas in Queensland, but one for which we have not heard a distinctive local name. It is not known to be poisonous or harmful in any way, but gives a rather offensive taint to milk and cream.
4. *Rhynchelytrum repens*, red natal grass. This grass is a very common grass in many parts of Queensland, particularly as a weed of cultivation. It is only of secondary value as a fodder; in coastal areas it is a very common weed on fruit farms, and has been found there to make excellent chop-chop for horses, and for dairy cows, either by itself, or mixed with better class fodders. It is not known to be poisonous or harmful at any stage of its growth.

Grasses and Sedges.

A.H. (School Project Club, Jandowae)—Nos. 1, 2, and 3. No specimen received.

4 and 5. *Eragrostis parviflora*, weeping love grass, a very common grass in Queensland pastures, particularly in the damper situations. The love grasses, on the whole, are of only secondary value as fodders, but, nevertheless, play perhaps an important part in making up the average native mixed pasture.

6 and 7. *Aristida calycina*, a three-pronged spear grass or wire grass. On the whole, they are of little value as fodders, though they will be eaten by cattle to some extent when young.

8. *Tragus racemosus*, small burr grass, a very common grass in many parts of Queensland, particularly on the Downs country. It provides a bite for sheep, but is of little value for larger stock. The burr-like seeds are an objectionable feature.

9 and 10. *Chloris virgata*, feather top Rhodes grass, or woolly top Rhodes grass. This grass, though rather a luscious-looking grass, is apparently unpalatable to stock. It has invaded much of the lucerne-growing country in Southern Queensland, particularly in the Lockyer valley, and has much reduced the earning capacity of some of the lucerne paddocks. Stock are said to eat it readily enough in the form of hay.

11 and 12. Very young specimens, but apparently the same as No. 4.

13. *Bothriochloa intermedia*, forest blue grass. This is the commonest native grass in much country on the Northern Darling Downs, the Burnett district, and Callide valley.

14. *Chloris gayana*, Rhodes grass.

15. *Eragrostis leptostachya*, paddock love grass. (See note on No. 4.)

16, 17 18, 19. *Cyperus difformis*, a sedge, not a true grass. The sedges, on the whole, have not the same value for fodder as the true grasses. A book soon to be published by the Department of Agriculture and Stock on "Principles of Botany for Queensland Farmers" will give you the differences between grasses and sedges. You should get your head teacher to obtain a copy for the school library.

20. *Eriochloa sp.*, early spring grass. The early spring grasses are very palatable fodders. The local name is not particularly appropriate, for though they come up with the early summer rains, they are no earlier than many other of the native grasses.

21. *Echinochloa colona*, wild or barnyard millet, a valuable fodder grass, closely allied to such well-known cultivated fodders as Japanese Millet or white panicum. It is mostly found either as a weed of cultivation or in damp spots in the pasture.

22, 23, 24, *Eriochloa sp.* (See notes under No. 20.)

25. *Eragrostis cilianensis*, stink grass, a native of Southern Europe, now a common naturalized weed in most warm temperate countries. In Queensland it is mostly found as a weed of cultivation, and, on the whole, is not eaten to any great extent by stock. The name stink grass comes from peculiar glands along the edge of the leaf, which give it the characteristic and not altogether unpleasant odour.

26. *Chloris ventricosa*, a star or windmill grass; the native chloris grasses or windmill grasses are valuable fodders.

27, 28. *Alternanthera denticulata*, a weed of the Amaranth family. (Amarantaceae). We have not heard a common name applied to it, but it is generally regarded as quite good fodder for stock.

29. Looks like a form of *Eragrostis parviflora*, weeping love grass.

30. *Sorghum sp.* This is either sudan grass, *S. sudanense*, or the wild sorghum, *Sorghum verticilliflorum*, but more complete material is required to be certain.

31. *Apsium leptophyllum*, wild carrot, a common weed of cultivation, and sometimes seen in ordinary pastures. It taints milk rather badly.

32. *Digitaria marginata*, summer grass, a very common grass in Queensland, mostly seen as a weed of cultivation—sometimes in the more sandy pasture country. It is quite a good fodder.

33. Looks like a species of *Commelina*, but specimen too poor to be sure. Species of Commelina are sometimes called scurvey grass in Queensland, and the leaves make quite a good vegetable, but they are some trouble to collect.
34. *Amarantus interruptus*, a very common weed of the Amaranth family (Amarantaceae). Probably quite a good fodder.
35. *Eragrostis elongata*, a love grass. (See remarks on No. 4.)
36. No inflorescence, but looks like nut grass, *Cyperus rotundus*. This is a sedge, and not a true grass.
37. *Setaria glauca*, a pidgeon grass. This grass mostly occurs either as a weed of cultivation or in damp spots in the pasture. It is very closely allied to such well-known cultivated fodders as Hungarian millet, Manchurian millet, &c.
38. *Heleocharis plana*, a sedge, not a true grass.
39. *Cyperus sp.* Inflorescence too broken to identify. This is also a sedge.
40. *Cyperus concinnus*, a sedge. The inflorescence is too young to be sure of its specific name.
41. *Sporobolus pallidus*, fairy grass.
42. *Cyperus laxus*, a sedge.

Wild Millet.

F.C.T. (Goondiwindi)—

The grass is wild millet, *Echinochloa Crus-galli*, which is widely spread over the warm temperate regions of the world. It is a very good fodder, and is closely allied to such well-known cultivated grasses as Japanese millet and white panicum. In Queensland it mostly occurs either as a weed of cultivation in country where the ground has been disturbed, or in rather damp situations in the pasture. We should thing it worth encouraging and trying in a new burn.

Varying Fodder Values.

F.J.I. (Miles)—

1. It is difficult to name grasses in the absence of seed-heads, but the present specimen appears to be *Cynodon dactylon*, the common couch, a very nutritious and palatable fodder grass, but not making very heavy growth.
2. *Aristida caputmedusae*. This is one of the wire grasses or three-pronged spear grasses. It is very common in sandy forest country on the Darling Downs and Maranoa districts. It has a very limited use as a fodder, but will be eaten by stock, particularly cattle, in its younger stages.
3. *Perotis rara*, comet grass, a very common grass in many parts of Queensland. The local name comes from the similarity of the seed-spike to the tail of a comet. It has little value as a fodder, but perhaps is of some importance in making up the general mixed native pasture, particularly on poorer-class country.
4. *Eleusine indica*, crowfoot grass, a very common grass widely spread over the warm temperate and sub-tropical regions of the world. In Queensland it mostly occurs as a weed of cultivation, and is moderately palatable. It contains a prussic-acid-yielding glucoside, but trouble from it in this State is very rare. The grass, of course, is not to be confused with crowfoot, the common herbage of the Darling Downs.
5. Impossible to determine from the material sent. May be a rush or a sedge, but flowers or seed-head required.

Blue Panic Grass.

D.C. (Chinchilla)—

The specimen forwarded was in a very young state; but there is no doubt it represents the blue panic or giant panic, *Panicum antidotale*. This grass has received a good deal of publicity of recent years, and it is undoubtedly quite a valuable standing feed, although, so far as we have observed, it seems to do best under cultivated conditions. It makes rather a cancy stem, but sends tufts of leaves out here and there at different points along the main stems, and these are much relished by cattle. Seed is obtainable through the ordinary commercial channels.

Grasses and Weeds.

J.C. (Calvert)—

1. *Cyperus difformis,* a sedge. In a work shortly to be published by the Department of Agriculture and Stock on "Principles of Botany for Queensland Farmers," the difference between sedges, grasses, and allied plants will be given.
2. *Achyranthes aspera,* chaff burr, a common weed in many parts of Queensland, both on the coast and inland. It is not known to possess any poisonous or harmful properties, and we cannot say that we have seen stock eat it to any extent.
3. *Alternanthera denticulata,* a weed of the amaranth family (Amarantaceæ). We have not heard a local name applied to it. It should be quite a useful fodder.
4. Looks like *Stachys arvensis,* stagger weed or wild mint. This plant causes shivers or staggers in working or travelling stock. Ordinary resting paddock stock such as dairy cattle, cows, &c., eat the plant with impunity. In fact, for them it seems quite a useful fodder.
5. *Teucrium argutum,* a native weed for which we have not heard a common name. When it grows in cultivation paddocks, it possesses white underground runners, which are much liked by pigs. When eaten, however, they cause animals to become highly excited and rush about until they become exhausted.
6. *Chenopodium carinatum,* a weed of the saltbush family. It contains a prussic-acid-yielding glucoside, and has been known to kill sheep in New South Wales.
7. *Chenonpodium triangulare,* fishy weed, a plant of the saltbush family, not much eaten by stock in the green stage, but when made into hay seems to be quite palatable. The green plant, if eaten by cows, imparts rather a fishy flavour to milk and cream, hence the local name.
8. *Panicum decompositum,* barley grass.
9. *Eragrostis leptostachya,* paddock love grass. The love grasses are not particularly good fodders, but nevertheless play rather an important part in the mixed native pasture.
10. *Zornia diphylla,* a native legume for which we have not heard a local name.
11. *Cyperus concinnus,* a sedge.
12. *Eragrostis parviflora,* weeping love grass.
13. *Cassia bicapsularis,* a native of tropical America, now widely cultivated as a garden shrub in most warm countries. It is most frequently known to nurserymen as *Cassia candolleana.*
14. *Jasminum suavissimum,* a native jasminth.
15. *Geranium dissectum,* native geranium, a useful fodder.

Arsenic Weed.

G.R.S. (Biggenden)—

The specimen forwarded by you under the name of Arsenic Weed is *Cassia sophera,* a native plant very widely scattered through Queensland. It has been suspected of causing losses among stock at different times, but We have not seen stock eat it to any extent. If eaten by them, it is almost sure to have a purgative effect, as it belongs to the same genus as the shrub producing the senna leaves of commerce. We have been told, and the evidence seems fairly good, that deaths have been caused by feeding on the young shoots of this weed. In respect to the local name, however, there is no connection, we should say, between the arsenic found in the stomach of the poisoned cow and this weed.

Grass out of Favour.

E.R.A. (Bowen)—

The specimen represents *Paspalum urvillei,* a native of Southern Brazil and the Argentine. This grass was boomed as a fodder some years ago, under the name of *Paspalum virgatum,* but has since gone out of favour.

Weeds of Cultivation.

G.R.S. (Biggenden)—

1. *Indigofera hirsuta*, hairy indigo, a fairly common weed of cultivation in many parts of Queensland, particularly in the Central coastal districts. Personally, we have not known stock eat it to any extent, but have been told by several experienced stockowners that both cattle and horses eat it readily enough, particularly when drying off slightly.

2. *Deeringia celosioides*, a very common plant of the Amaranth family (Amarantacæ). It mostly grows in the rather drier scrubs, on scrub edges, and is frequently common in the Burnett and Callide Valleys as secondary growth. We have not heard a local name given to it. It is not known to possess any poisonous or harmful properties at any stage of its growth.

3. *Malvastrum spicatum*, a very common weed of the mallow family. We have not heard a distinctive local name given to it. It is sometimes called *Sida retusa*, but the true *Sida retusa* is a rather different plant.

4. *Cenchrus australis*, hillside burr grass, or scrub burr grass. This grass is very common throughout the coastal and near coastal belt of Queensland. It is particularly abundant along scrub edges. We should not say it had much value as a fodder. It is a very common weed of parts of the Atherton Tableland, and is known there by the rather absurd name of scotch lice. Insects sometimes get entangled and caught in the hooked burrs of the seed-head.

Fodder Grasses.

W.E.T. (Mitchell)—The three specimens have been determined as follows:—

1. *Chloris virgata*, feather top or woolly top, sometimes called feather top or woolly top Rhodes. This grass mostly occurs in Queensland as a weed of cultivation. It is rather a luscious-looking grass, but on the whole we have found that stock do not eat it very readily. It is said to be much more palatable in the form of hay. Of recent years this grass has very badly infested many of the lucerne-growing districts, and very much reduced the earning capacity of some of the lucerne paddocks.

2. *Echinochloa colona*, wild millet. This grass is a very good fodder, and is closely allied to such well-known cultivated fodders as Japanese millet and white panicum. In Queensland it mostly occurs either as a weed of cultivation or in rather damp places in the pasture.

3. *Eleusine indica*, crowfoot grass. We have heard this grass called holdfast, on account of the very tenacious hold it has on the soil. It is moderately palatable to stock, but, like sorghum and some other fodders, contains a prussic-acid-yielding glucoside. Very little trouble, however, is experienced with it in Queensland. It mostly occurs where the ground has been disturbed, such as old cultivation areas, around cowyards, and along railway embankments, and is not usually seen as a member of the ordinary pasture.

All grasses are summer growers.

Madagascar Plum. Mesquite Bean.

"Sap" (Townsville)—

The fruit forwarded by you is *Flacourtia cataphracta*, commonly known in Queensland as the Madagascar plum. It is a very pleasant fruit to eat, and the reason why some trees are barren is that the male and female flowers are borne on distinct trees.

The bean forwarded under the name of Urandangie pest is the mesquite bean, *Prosopis juliflora*, a native of South America, the West Indies, Central America, Mexico, and the southern United States. It is now widely cultivated in tropical countries as a fodder and ornamental tree. We have realized, however, the possibility of this plant becoming a pest in Queensland, somewhat in the same way as the Parkinsonia Tree has in parts of New South Wales. Any particulars you could give about the spread of this tree about Urandangie would be much appreciated.

Potato Bush.

M.L. (Brisbane)—

The specimen forwarded by you is a species of Solanum or Potato Bush. A number of these are naturalized in Queensland, and are very common on much of our pasture country on the Downs and inland generally. The piece you send is a very small piece indeed, and as many of these are so much alike, we would very much like to have a larger specimen to make sure, but yours is either *Solanum ellipticum*, the spiny potato bush, or *Solanum cinereum*, the narrawa burr. These plants are at times very common, but we have not seen them in sufficient quantities to class them as a serious pest.

Salt Weed.

Inquirer (Cunnamulla)—

The specimen forwarded represents the shrub salt wort or salt weed. *Arthrocnemum halocnemoides*, sometimes called the shrub glass wort, or glass weed, due to the fact that these plants are rich in soda. An allied species in the early days was used in Europe in the manufacture of glass. It belongs to the saltbush family (Chenopodiaceæ).

Crowfoot.

J.J.S. (Helidon)—

It is rather difficult to name specimens of plants in the very young stage, but we do not think there is any doubt that yours represents the Crowfoot, *Erodium cygnorum*, a very common herb on the Downs country and Southern Queensland. It belongs to the geranium family (Geraniaceæ). It is not as valuable a fodder as the native geranium.

A Good Native Grass.

M.J.C. (Westwood)—

Your specimen proved to be *Brachiaria praetervisa*, a native grass, quite a good fodder, but one for which we have not heard a local name. Practically all the brachiarias are useful fodder grasses, but the present one, like others, seems to prefer cultivated ground, or ground that has been disturbed, rather than the ordinary pasture. This is unusual in native grasses.

Leguminous Herb. "Devils' Fig."

B.D. (Ingham)—

1. *Cassia mimosoides*, a common leguminous herb of rather woody character, usually found in grass country throughout coastal and North Queensland. It is not known to possess any particular properties, useful or otherwise. We have not seen stock eat it to any extent, but it would probably be quite a useful fooder. Some of the cassias cause purging.
2. *Solanum torvum*, a very common weed, widely spread over the tropical countries of the world. It is quite common in parts of coastal Queensland and in some areas is regarded as rather a serious pest. It is most frequently known as "devil's fig."

Possibly Valuable Legume.

Inquirer (Brisbane)—

The specimen from Gracemere is *Stylosanthes guianensis*, several of which have been imported at different times following on the success that an allied species, *S. sundaica*, has been in parts of Queensland. This latter species has certainly very much improved the carrying capacity of much of the country in North Queensland, particularly about Townsville. We have seen several specimens of the plant, but have not seen fertile seed. This does not say, of course, that fertile seed is not produced, but unless it is, the plant is of very little value for Queensland. If it does produce fertile seed, then we think it is a valuable legume, and should approximate lucerne in feeding value. It will grow under more tropical conditions than ordinary lucerne, and is valuable in this respect. We have found with *S. sundaica*, the common Townsville lucerne or wild lucerne, that stock prefer it in a wilted condition to green and luxuriant.

Scrub Panicum.

Inquirer (Brisbane)—

The specimen submitted is the *Setaria australiensis*, commonly called in Queensland the scrub panicum, a native grass frequently seen around scrub clearings, along scrub tracks, etc. It is generally regarded for such places as quite good fodder, but it is hardly worth cultivating, for where it should grow, better fodders, such as giant setaria or Manchurian millet, which are very closely allied to it, would grow equally well. Seed of the scrub panicum is not stocked by nurserymen, but the giant setaria is obtainable through commercial channels at a fairly cheap rate.

Galvanised Burr.

Inquirer (Pittsworth)—

The *Bassia birchii*, or galvanised burr, a sample of which you have sent, is a native of Central Queensland. Within comparatively recent years it has spread over much land, particularly on stock-routes, or on land that is heavily stocked. It has caused some concern to graziers, and the Council of Scientific and Industrial Research is carrying out experiments on the weed in the neighbourhood of St. George.

Gooseberry Cucumber.

J.P.D. (Kingaroy)—

One of the specimens sent is the Gooseberry Cucumber or Paddymelon, *Cucumis myriocarpus*, a native of South Africa. It is now very common as a weed in many parts of Queensland, particularly on the Darling Downs. It is generally regarded as harmful to stock, but feeding experiments in Australia, so far as we know, have given negative results. In South Africa, however, it has been proved that the watery sap is poisonous, particularly that of the ripe fruits. The rinds and seeds are quite harmless. The symptoms are severe purging, and in some animals, vomiting.

Native Pasture.

C.C. (Maryvale)—

Your specimen represents the common Kangaroo grass, *Themeda australis*. This is a native grass. It is one of the better grasses of the native pasture, although, when it becomes mature, it is rather fibrous. It is considered to be a fairly good fattening grass for cattle, although some of the softer kinds of grasses, such as the native panicums, form a useful addition to the pasture.

Leguminous Plants.

"Sap" (Townsville)—

What you have sent is *Atylosia scarabacoides*, a leguminous plant, which is widely spread in India and Malaya, and parts of Melanesia. Unfortunately, we have no records of its fodder value. However, as you say it is readily eaten by stock, we think that is a fair indication that it is a good fodder plant. Many native leguminous plants are strictly avoided by stock, and this gives one the impression that they are either unpalatable or harmful.

Indian Heliotrope.

Inquirer (Rockhampton)—

Heliotropium indicum (Indian Helliotrope) is a native of tropical Asia, but is now a naturalised weed in parts of Queensland. It is particularly abundant about Rockhampton. It is not known to possess any poisonous or harmful properties.

Wild Sunflower. Black Nightshade.

F.A.S. (Columboola, W. Line)—

(1) *Verbesina encelioides*, wild sunflower. This plant has been definitely proved by feeding tests to be poisonous to sheep.

(2) *Solanum nigrum*, black nightshade. The green parts of most *solanums* are poisonous to stock. If the present plant were eaten to any extent it would be harmful. It is not usually eaten by stock in sufficient quantities to cause trouble, although the specimens you sent show marked signs of having been trimmed by stock.

General Notes

Staff Changes and Appointments.

Messrs. P. A. Kelly and R. E. Watson, inspectors of dairies, Department of Agriculture and Stock, have been transferred from Oakey to Goombungee and Goombungee to Oakey, respectively.

Constables V. Jensen (Thangool) and F. A. S. Goodwin (Jundah) have been appointed also inspectors under the Slaughtering Act.

Mr. W. J. Richardson, cane tester, has been transferred from the Babinda Mill to Tully Mill. Miss M. A. Morris has been appointed a cane tester at the Babinda Mill, and Mr. C. W. Steley an assistant cane tester at the Tully Mill, Tully.

Constable W. Mollenhauer, Isisford, has been appointed also an Inspector under the Slaughtering Act.

Senior Sergeant E. O. Hall, Charleville, has been appointed also an Inspector under the Slaughtering Act.

The following have been appointed assistant cane testers for the forthcoming sugar season at the mills indicated:—Miss D. Aldridge (Millaquin), Mr. R. Anderson (Fairymead), Miss K. Backhouse (Moreton), Mr. A. Byrne (Millaquin), Miss P. Eadie (Bingera), Mr. G. R. Kronk (Maryborough), Mr. J. Kinnon (Fairymead), Mr. C. M. Martin (Bingera), Mr. R. A. Stephenson (Moreton), Mr. W. P. Snewin (Isis), and Miss P. Thorburn (Isis).

Mr. J. Wagner, Howes and Melton roads (Nundah), has been appointed an honorary ranger under the Animals and Birds Acts.

Mr. R. C. Cannon, B.Sc.Agr., Field Assistant, Department of Agriculture and Stock, has been appointed Instructor in Agriculture, Dimbulah.

The following have been appointed cane testers for the forthcoming sugar season at the mills specified:—Messrs. C. J. Boast (Isis), P. H. Compton (Bingera), T. F. Corbett (Moreton), T. D. Cullen (Millaquin), T. Herbert (Gin Gin), L. C. Home (Mount Bauple), J. Howard (Rocky Point), J. McFie (Maryborough), and Misses A. L. Levy (Fairymead) and J. O'Flynn (Qunaba).

Boundaries of Northern Stallion District.

A Proclamation has been issued under the Stallions Registration Acts altering the boundaries of the Northern Stallion District to include the Petty Sessions Districts of Ingham, Herberton, Atherton, and Mareeba.

Sectional Group Committee Electorates.

Regulations have been issued under the Fruit Marketing Organisation Acts providing that, for the purpose of electing members of the Banana, Pineapple, Citrus, Deciduous, and other Fruits Sectional Group Committees, certain local producers' associations and groups of associations throughout the fruitgrowing districts of the State shall constitute electorates, and shall elect the members of the various sectional group committees.

Qualifications in Veterinary Science.

An Order in Council has been issued in pursuance of the provisions of "*The Veterinary Surgeons Act of* 1936" providing that the degree or diploma in veterinary surgery of the Royal College of Veterinary Surgeons, Great Britain, the United States College of Veterinary Surgeons, America, the Universities of Sydney, Melbourne, and Queensland, shall be recognised as entitling the holder or member, as the case may be, to practise as a veterinary surgeon. For the purposes of the Act also an Order in Council has been issued declaring the Queensland Agricultural High School and College, the Hawkesbury Agricultural College, and the Wagga Experimental Farm, New South Wales, the Roseworthy Agricultural College, South Australia, the Dookie Agricultural College, Victoria, and the Muresk Agricultural College, Western Australia, to be Institutes affording a training in veterinary science.

Wild Life Preservation—A Goondiwindi Sanctuary.

A sanctuary under the Animals and Birds Acts embracing the property of Mr. P. A. Wright, "Kindon," Goondiwindi, has been declared. Mr. C. D. McKenzie, manager of "Kindon," has been appointed an honorary ranger under the Acts.

Rural Topics

Whitewash Hints.

Whitewashing is usually regarded as a very poor substitute for painting, but when properly done it has many uses for which paint is not suitable. One advantage is the ease and rapidity with which it can be applied, and its cheapness is another recommendation. The surface to be whitewashed should be just as clean as one that is to be painted, and it is a first essential to good results that all dirt, dust, grease, and scaly material should be removed before there is any attempt to apply the wash. This implies a liberal use of scrapers and stiff brushes. When the cleaning is finished, and the surface dusted, it is well to dampen it slightly just before applying the wash. Whitewash may be applied with the brush or sprayer. Let the coat be fairly thin and transparent and it will be opaque when dry. In using sprayers it is necessary that the wash be strained through at least two thicknesses of cheese cloth. In estimating the quantity of material required many problems and conditions are encountered, but the following general figures may be used as a basis: One gallon of whitewash will cover approximately 225 square feet of wood, 180 square feet of brick, and 270 square feet of plaster. Using a 4-inch brush a man will cover 200 square feet of ceiling, 200 square feet of rough wall, or 350 square feet of smooth wall in one hour. Prepare the lime and water paste a few days before using. Where casein, glue, or formaldehyde are to be used, the solutions must be brought together only when they are quite cold. This is very important. The solutions mentioned should be added very slowly and at the same time they should be stirred vigorously and constantly.

In no case should you mix more of the wash in one day than you can use in that day when using any of the solutions mentioned above. Skim milk may be used as a substitute for casein, but it is not quite so effective. In place of one sack (50 lb.) of hydrated lime, you may use the paste made by slacking ½ bushel (38 lb.) of fresh quick-lime with about 6 gallons of water. This slaking is sometimes done by placing the quick-lime in a barrel and adding the water boiling hot. If cold water is used the water may be added a little at a time, stirring each time; when heat ceases to be given off the lime is slaked. Before using, strain this paste through a fine screen.

Molasses is said to render the lime more soluble and to give it a greater penetrating power. Use in proportion of 1 pint of molasses to 5 gallons of the wash. Alum tends to prevent rubbing and is used in proportion of 1 oz. to 1 gallon of the wash. If a gloss is desired, dissolve 1 lb. of bar soap in a gallon of boiling water, and when it is cold add to 5 gallons of the thick wash.

Two Weeds Poisonous to Stock.

On the Darling Downs, in the Maranoa district, and in some other parts of Queensland, there is a very common weed sometimes seen in cultivation and along watercourses. It is upright in growth, about 3 feet high, with white flowers followed by a spiny seed pod, splitting at the top into four parts, and containing a large number of blackish seeds. In the districts mentioned it generally goes under the name of castor oil and the question is often asked if it is the true castor oil of commerce.

The fact is that the true castor oil is a different plant. The seed pods are superficially alike, but the plant is very much larger. Instead of being a small weed of cultivation, it is a shrub, or even a small tree, up to 10 feet high. It is very common around vacant allotments in coastal towns, and along creek and river banks in the near coastal districts. The seeds of the true castor oil are also poisonous and have sometimes been eaten in the mistake that they would have the same effect as a dose of castor oil. People who have accidentally or intentionally eaten the seeds have become violently ill, and it is said that in some cases even death has ensued. When the oil is expressed from castor oil seeds the residue contains a poisonous principle and this precludes the use of castor oil cake as a stock food.

The other plant is stramonium or thorn apple, and all parts of this plant are poisonous. It possesses a nauseating odour and flavour, and, on this account the standing plant is rarely eaten by stock. On several occasions, however, the seeds and parts of the dried plant have been found as an impurity in chaff and have caused the deaths of working horses and town cows. The seeds of this plant are the most poisonous part and poultry should not be allowed to run where the plant is growing.

Stock Foods and Feeding.

To get the best returns from their livestock, producers should know not only the best combinations of foods, but the mechanical condition in which they should be given.

Broadly speaking, foodstuffs may be classed as concentrates and roughages; and the type of animal and the purpose for which it is used should determine the condition in which the foodstuffs are fed.

No stock owner should purchase equipment for chaffing, grinding, crushing, soaking, or cooking foodstuffs until he is convinced by trial that the extra returns will repay the cost.

The argument most commonly advanced in favour of prepared foods is that there is a saving in the energy normally expended in biting, grinding, and digesting, and that this saving may be diverted to extra production.

This is only a half-truth. Nature has given every animal an efficient mechanism for digesting and assimilating food and, if this intricate mechanism is, through the agency of man, prevented from functioning normally, it may not function as nature intended, with the result that the animal will not thrive as well as it should.

Under the modern system of selective breeding and intensive feeding it becomes necessary at times to convert some foods into more readily digested forms; but it must not be assumed that the success obtained with one class of animal, or one type of food, is applicable to all classes and types.

European and American findings have been correlated with Australian experience and summarised for the benefit of livestock owners.

Beef Cattle.—Pasture fattening is the accepted method of preparing beef cattle for market. It appears likely that the fattening of some "chiller grade" steers on compartively small properties will become more general. This will involve the use of some concentrates and possibly silage. Corn-in-cob is the most economical method of feeding maize to "top off" steers.

Sheep.—Merinos, which represent the majority of Queensland's sheep population, are only fed with concentrates in times of stress. Fortunately sheep are extremely thorough masticators, and it is only with very hard grain that crushing is necessary.

With the cross breeds, or meat breeds, it rarely pays to prepare the food. An exception may be made of lucerne hay, which sheds its leaves readily and consequently involves a loss due to the selective feeding of the animal. It therefore pays to chaff lucerne hay so that a proper admixture of stem and leaf is assured and waste avoided.

Concentrates in compressed "cube" or "nut" form are often fed to sheep, and may be swallowed whole. They are rapidly disintegrated under the action of digestive juices, so that there is no need to treat them in any way.

Horses.—There is no need to prepare oats or corn in any way, but harder grain should be crushed. Soaking is rarely justified and only when soaking of very hard grain is cheaper than crushing.

Roughage may be chaffed for hard worked horses, stud animals, or animals being prepared for exhibition. It is quite unnecessary for idle horses.

Very fine foods are to be avoided. Milling by-products should be carefully incorporated in the bulky feed, and if dusty a little water—preferably sweetened with molasses—may be added.

When the Cart is Bogged.

One of the common experiences of farm life is to be bogged with a cart or dray, down perhaps to the axle. This is how to get over the difficulty. Take off the leader and hook him on to the wheel that is bogged. A chain, or some wire doubled and put round the spoke and over the tyre, fixed far enough back to give a good pull, is sufficient for the job. Tie well back past the top of the wheel, about three-quarters of the way up the other side, so that the first strain will be at such an angle as to pull forward without any chance of slipping. Stand the team up to a pull together, and this will give all the extra purchase needed to lift the wheel clear. If the wheel should happen to slip, tie a piece of wood to the bottom of the wheel or strap a piece of timber to a spoke to act as a grip to lever against.

Fat Lamb Production.

Gratifying results have followed the scheme initiated by the Minister for Agriculture and Stock with the object of stimulating the production of fat lambs. Rams of British breeds, comprising Border Leicesters, South Downs, Dorset Horns, Shropshires, and Romney Marsh, were purchased in the South and distributed to farmers who had cultivation available, or who were prepared to cultivate. In certain cases in which a farmer owned a stud ram of a particular breed, stud ewes were supplied with the idea of fostering the breeding of pure stock. All sheep supplied to farmers are on loan, and remain the property of the Department. The progeny and wool, however, become the property of the farmers concerned.

The greatest drawback to the production of fat lambs on the Darling Downs in quantity has been, and still is, the difficulty of purchasing good crossbred ewes as the mother flock.

If a start has to be made with merinos the best ewe for fat lamb raising is bred by the introduction of one of the long wools, such as Border Leicester, Lincoln or Romney Marsh into the strong-woolled, robust type of merino ewe. The ewe lambs of this drop should then be retained as the future dams of the lamb-raising flock.

As to suitable ewes for the fat-lamb industry, it is believed that graziers on the fringe of the Darling Downs or further out would find it profitable to join long-woolled rams of British breed with their cast-for-age ewes with the idea of selling the progeny annually as fat lamb ewes on the Downs. Into the crossbred ewe flock, as described, should be introduced a ram of the Downs type. Opinions necessarily differ in the matter of crosses. The South Down is the fashionable lamb at the present time, but it should be remembered that this cross must suffer no check from birth to block. The Dorset Horn gives a very nice lamb, early maturing and hardy. The use of the Border Leicester should be encouraged in every way. In addition to producing an early-maturing lamb that fills every want, it must be remembered that the skin value of this lamb is worthy of consideration to a far greater extent than either the Dorset or the South Down.

Purebred Corriedale ewes are hard to come by, but should the opportunity occur a farmer would be well advised not to let it slip. Pure Corriedales are hard to beat, good mothers and heavy milkers, besides growing a profitable fleece.

Generally, the wool from a flock retained for fat lamb breeding is a secondary consideration when compared with the production of fat lambs.

The Handling of Small Clips.

It is always a problem for the farmer who is running a few sheep to get full value for the wool he cuts. Hence the service given to farmers by the Department of Agriculture and Stock through the farmers' wool scheme. Should the number of sheep depastured enable a farmer to prepare correctly the bulk of his wool for market, he is advised to do so. Star lots and oddments should then be sent to the Department for classification, with the object of getting full market values.

An advance of 60 per cent., free of interest, of the estimated value of the wool, is made by the Department to growers running less than 1,500 sheep. In the meantime, the wools received are classed into large lots, where that is possible, thus meeting with full competition when placed on the market.

Should the bulk of the clip be prepared for market on the property, it is necessary that all fleeces should be carefully skirted and all stains removed. The classification of the fleeces calls for special knowledge and, if the farmer is not capable of doing it himself, he should employ a man competent for the work. A few pounds spent in the proper get-up of a clip may be regarded as economy, the farmer being more than recompensed for the outlay by the enhanced prices received.

If the farmer has insufficient sheep to make the services of a classer worth while, the Department is prepared to make the services of an officer available for instructional purposes on the property.

Lifting Pigs.

Sometimes a farmer has three or four pigs to be sent away on a lorry and has no loading race, thus making it awkward to load them. One man stands on the left and holds the pig's ear with his left hand while another stands on the right and holds the pig's tail with his left hand. Both must then grasp hands under the pig's chest near the front legs, and it is then an easy job to lift it into the lorry.

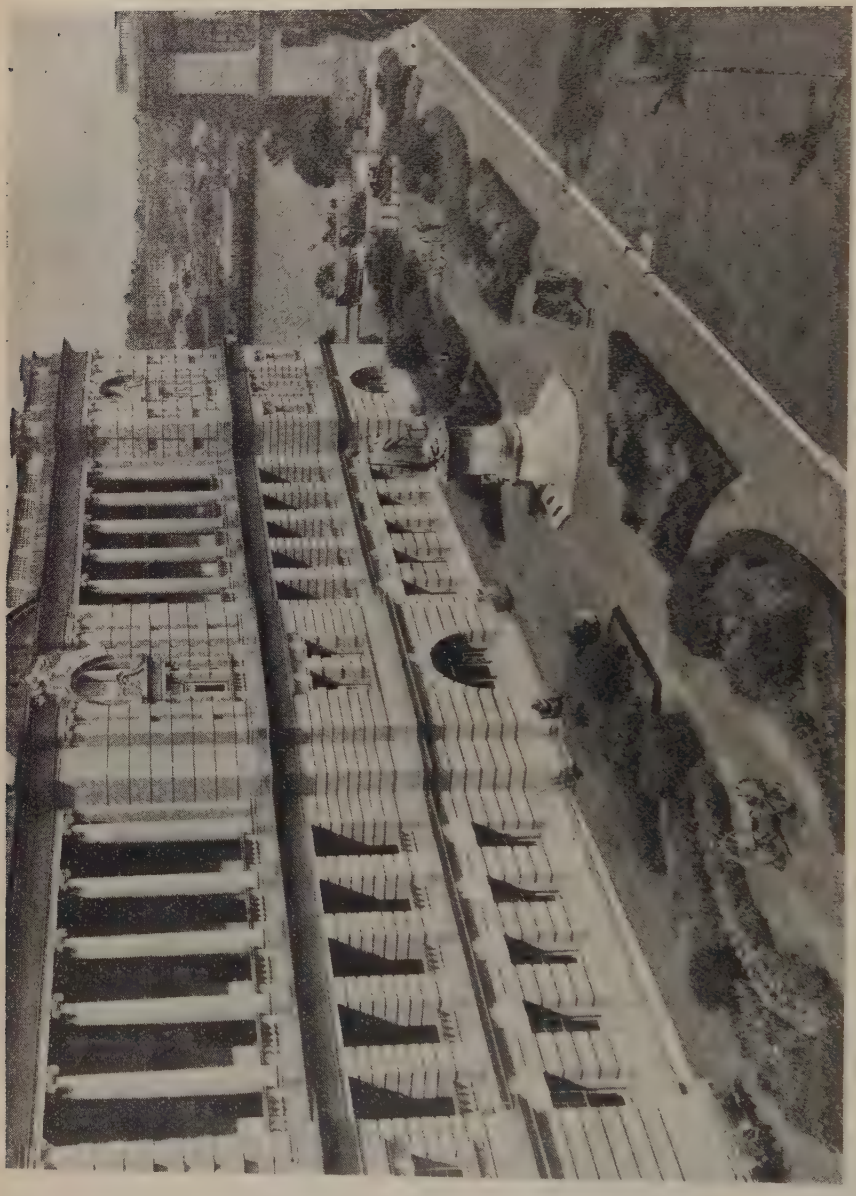


Plate 91.

A View of Queen's Gardens, Brisbane.

Showing the Executive Building and a glimpse of the Brisbane River beyond. The flower beds supply a blaze of gorgeous colouring the whole year round.

Orchard Notes

SEPTEMBER.

THE COASTAL DISTRICTS.

IN the North Coast and Gayndah districts the bulk of the citrus crops have been harvested with, perhaps, the exception of Valencia Lates. Orchard activities should be directed towards pruning, cultivation, fertilizing, and spraying. As a result of seasonal conditions there are numerous instances of trees showing signs of impaired vigour, and these will require a severe pruning both in thinning and shortening back, removing superfluous growths and diseased and weakly woods. Healthy and vigorous orange trees will require little attention beyond the removal of crowded lateral growths.

Mandarins will need special treatment, particularly Glen Retreats and Scarlets. These varieties usually produce a profusion of branches, and as the trees mature the growths harden and the fruit-bearing shoots make short, weakly growths, which generally results in an over-production of small fruits and a weakening of the trees. This is particularly noticeable in the case of the former variety. Here the annual pruning should consist of a heavy thinning and shortening back. Mature mandarin trees require attention towards assisting them to produce new and vigorous fruit-bearing growths.

Unprofitable trees should receive attention and be prepared for top-working. They may be headed back to three or four main arms radiating from the stem and whitewashed to prevent bark scald. Such trees may be grafted or later budded when suitable growths have matured.

Prior to working up the soil fertilizing should receive attention. The spring application should carry a high percentage of nitrogen.

In the warmer districts which are free from frosts plantings of young trees may be made. Serious consideration should be given to the selection of commercial varieties only, and, having due regard for local conditions, selections may be made from the following varieties:—Washington, Navel, Joppa, Siletta, Valencia Late, Beauty of Glen Retreat, Emperor, Scarlet, Solid Scarlet, Marsh Seedless or Thompson grapefruit, and Villa Franca, Lisbon, and Genoa lemons.

Where Melanose and Black Spot are present in orchards preparations for control measures should be made, and Bordeaux sprays applied at the correct times.

The majority of citrus trees would be considerably benefited by the application of a strong lime-sulphur wash, 1-18.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

BLACK aphis should be fought wherever it makes its appearance by spraying with a tobacco wash, such as black-leaf forty, as if these very destructive insects are kept well in hand the young growth of flowers, leaves, wood, and fruit will have a chance to develop.

The working over of undesirable varieties of fruit trees can be continued. The pruning of grape vines should be done during the month, delaying the work as long as it is safe to do so, as the later the vines are pruned the less chance there is of their young growth being killed by late frosts. Keep the orchards well worked and free from weeds of all kinds, as the latter not only deplete the soil of moisture but also act as a harbourage for many serious pests, such as the Rutherglen bug.

New vineyards can be set out, and, in order to destroy any fungus spores that may be attached to the cuttings, it is a good plan to dip them in Bordeaux mixture before planting. The land for vines should be well and deeply worked, and the cutting should be planted with one eye only out of the ground and one eye at or near the surface of the ground.

In the warmer parts which are suitable for the growth of citrus fruits, the land must be kept well cultivated, and if the trees need irrigating they should be given a good soaking, to be followed by cultivation as soon as the land will carry a horse without packing.

In these parts fruit fly should be systematically fought, as it will probably make its appearance in late citrus fruits and loquats; and if this crop of flies is destroyed, there will be every chance of the early crops of plums, peaches, and apricots escaping without much loss.

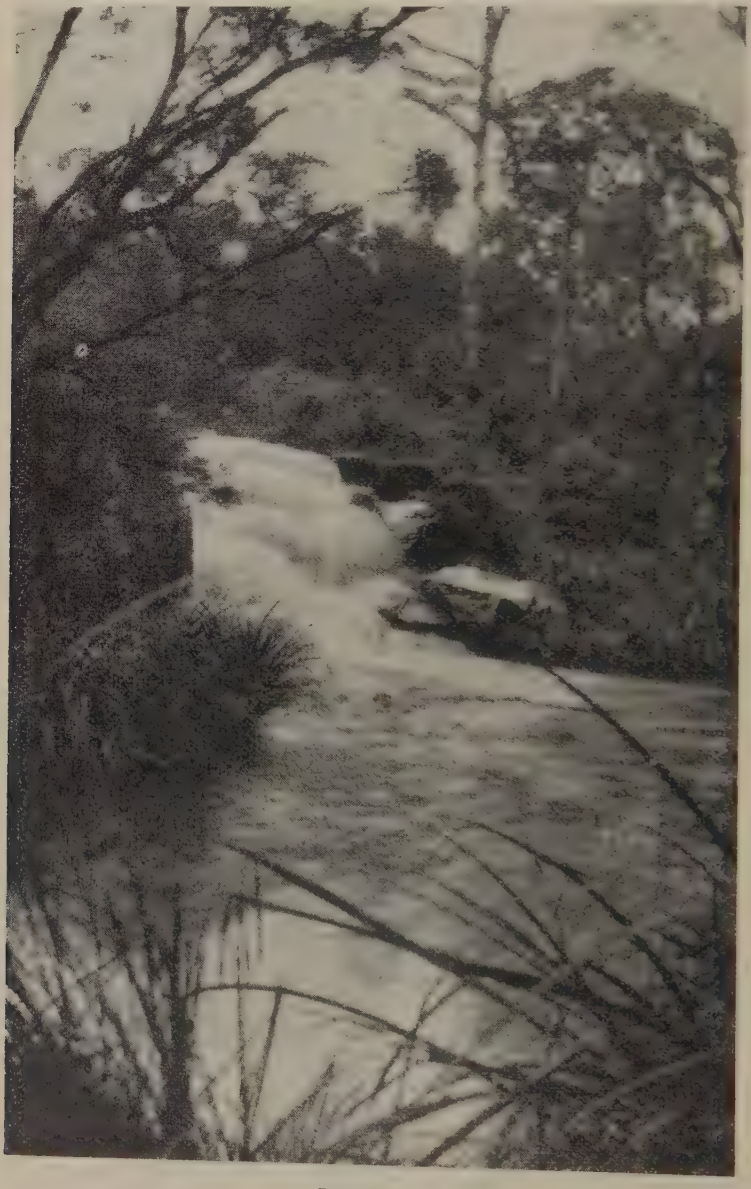


Plate 92.

Daggs Falls, near the Spring Creek Road, at Killarney.

Farm Notes

SEPTEMBER.

WITH the advent of spring, cultivating implements play an important part in farming operations.

The increased warmth of soil and atmosphere is conducive to the growth of weeds of all kinds, particularly on those soils that have only received an indifferent preparation.

Potatoes planted during last month will have made their appearance above the soil, and where doubt exists as to their freedom from blight they should be sprayed with either Burgundy or Bordeaux mixture as soon as the young leaves are clear of the soil surface.

Land which has received careful initial cultivation and has a sufficiency of sub-surface moisture to permit of a satisfactory germination of seeds may be sown with maize, millets, panicum, sorghum, melons, pumpkins, cowpeas, broom millets, and crops of a like nature, provided, of course that the areas sown are not usually subjected to late frosts.

Rhodes grass may be sown now over well-prepared surfaces of recently cleared forest lands or where early scrub burns have been obtained, and the seed is sown subsequent to showers. More rapid growths, however, are usually obtainable on areas dealt with, say, a month later.

In connection with the sowing of Rhodes grass, farmers are reminded that they have the Pure Seeds Act for their protection, and in Rhodes grass, perhaps more than any other grass, it is necessary that seed of good germination only should be sown. A sample forwarded to the Department of Agriculture will elicit the information free of cost as to whether it is worth sowing or not.

Where the conditions of rainfall are suited to its growth, paspalum may be sown this month.

The spring maize crop, always a risky one, requires to be sown on land which has received good initial cultivation and has reserves of soil moisture. Early maturing varieties so-called "90 Day," are preferable for spring sowings, as they will make the best use of the moderate rains usually received during the early summer months. Inter-row cultivation is important, checking weed growth and maintaining the surface soil in a friable condition.

Although cotton may be sown this month, it usually stands a better chance if deferred until October, when the warmer temperatures allow of the obtaining of better germination and promote a healthier growth of the resultant seedlings. The harvesting of cotton during the normal rainy season is, if possible, to be avoided.

The sowing of intermediate crops prior to the preparation of land for lucerne sowing should be carried out in order that early and thorough cultivation can take place prior to the autumn sowing.

The following subsidiary crops may be sown during the month:—Peanuts, sweet potatoes, arrowroot, cow cane, and in those districts suited to their production yams and ginger. Plant out coffee.

NOTICE TO SUBSCRIBERS.

When renewing your subscription, write your full name plainly, preferably in block letters.

Address your renewal to the Under Secretary, Department of Agriculture and Stock, Brisbane.

OUR BABIES.

Under this heading a series of short articles, by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.

REST AND SLEEP.

THE newborn baby normally sleeps nine-tenths of its time, and at six months two-thirds of its time. The baby should be trained to sleep at the same time every day and all night. The habit of sleeping peacefully is one of the clearest evidences of sound health. Normal, healthy babies should be trained from the beginning to have no night feeding. This ensures an undisturbed night's rest to the mother, and establishes the baby in his proper rhythm from the start, saving him from the period of irritability, disturbed rest, and slackening of growth incidental to the breaking of a bad habit a few months later. Why break in on the night's rest? Why impart any tendency to insomnia at the start of life? Happy is the baby who sleeps all night from the dawn of existence.

It is well to continue the morning rest until the child is three or four years old, especially during summer, when children wake early. Even if the child does not sleep, the habit of resting is of great value. A short rest, or sleep, restores a child wonderfully, and the result is that there is no crossness or fatigue at the end of the day.

In forming good habits of rest and sleep, regularity is necessary. Do not pick the baby up when he cries at night. However, the mother should make sure that the baby is quite dry; that he is not suffering from wind; and is quite snug and comfortable. It is possible to change the baby's napkin without waking him.

The baby should be trained as soon as possible to sleep during the hours when the mother is busiest with her household duties. He will then take a long sleep during the morning, stay awake for an hour or two, and take a long nap in the early afternoon. As baby grows older he should not be encouraged to have a long sleep in the late afternoon, as he then will not be ready to go to sleep after the evening meal (5.30 to 6 p.m.). A late afternoon sleep also interferes with the early afternoon outing. It would be a great advantage to the entire household, apart from the health and benefit accruing to the child, if young mothers would contrive to have the baby and younger children asleep in bed before the father arrives home for the evening meal. Never play with and excite a baby just before bedtime. While natural mothering and moderate handling is beneficial, injudicious or excessive handling or stimulation is highly injurious.

OVERSTRAINED BABIES SLEEP BADLY.

Children are fond of babies and never tire of stimulating their funny performances. This should not be permitted. Unfortunately, some parents and friends are just as foolish in amusing themselves at the expense of the baby. A little gentle stimulation by the mother may be harmless, and even beneficial, to some babies. Continual stimulation (especially before bedtime) spoils their sleep, upsets their nutrition, and makes them nervous and irritable. This is giving them a very bad start in life, and may have undesirable consequences in the future.

Some parents are in the habit of taking their children, and even their babies, out with them in the evening, shopping or visiting. In some instances there is no one with whom they can be left, but baby's welfare should always be considered first. It is worse still to take them to the cinemas, where they become overtired or over-excited, and are exposed to the great risks of infection with influenza, catarrhs, and other diseases, leading perhaps to pneumonia or abscess in the ears.

HOW MUCH TO EAT.

(Contributed by the Queensland Nutrition Council).

"LIVE to eat!" or "Eat to live!"—which shall it be? As is the case with so many vexed questions, neither extreme is correct. Would you call normal the man who gulps down a few mouthfuls of food placed before him by an insistant wife, with no thought for its delicacy or method of serving? Do you, on the other hand, really envy the man who turns every meal into a feast, rising with disappointment, and some difficulty, when the last available particle has disappeared, to seek in repose an opportunity for overworked nature to catch up in the eternal competition? Most assuredly you do not envy either of these extreme individuals. "Moderation in all things and all things in moderation," should be one's motto in eating, as in all the necessities and pleasures of life.

The Appetite.

Scientists will tell you that hunger is accompanied by contractions of the muscular stomach wall, and that these contractions are associated with the secretion of adrenalin from one of the ductless glands. This in turn may be due to a falling level of sugar in the blood. The whole mechanism is very complicated, and appetite is not exactly the same as hunger. Every normal person should experience appetite, but only the starved person, should feel real hunger.

We all know what appetite is and the normal variations to be expected, though they are difficult to define. Appetite may become abnormal in three ways—(i.) lessened (ii.) increased (iii.) perverted. It should be the aim of every person to keep the appetite within normal limits by neither denying nor satiating it. If, in spite of this reasonable behaviour, it persists in being abnormal, there must be a cause, and the cause must be found. The person to do that is your doctor.

The chief causes of lessened appetite are:—

Worry.—A very common cause, especially in women, but also in men.

Irregular eating as indulged in by the housewife who "picks" between meals, the school-child spending his pennies on sweets, and the busy man who "just cannot be bothered."

General loss of condition from overwork, lack of exercise, loss of sleep, etc.

Ill-balanced diet.—Diet which continues to contain a deficiency of some necessary item (especially vitamin B) very often leads to a loss of appetite.

Gastric abuse.—The continued use of food or drink irritating to the stomach, e.g., chronic over-indulgence in alcohol, will impair the appetite.

Gastric diseases of various kinds affect the appetite. If there is any reason to suspect these, the doctor should have the earliest opportunity of finding this out.

General disease, even a cold will impair the appetite. In such cases it is not wise to force it too enthusiastically.

The way to correct diminished appetite is not to force unwelcome food in blank defiance of the body's desires, but to set about finding out why the appetite is poor. *One should examine one's eating habits candidly and firmly.* Only too often the habits are entirely at fault. The importance of doing this early is not merely the restoration of a pleasant bodily function but the prevention of actual digestive disease. Loss of appetite, "indigestion," distaste for food are often friendly warnings that the digestive apparatus is being ill-treated. If they are ignored, actual disease frequently develops. If there is any doubt at all on the matter, particularly if no fault can honestly be found with the eating habits of the individual, a medical man should be consulted, especially if the sufferer is getting on in life.

Increased Appetite.

A definitely increased appetite occurs in some diseases such as exophthalmic goitre and diabetes. Apart from this, however, many people feel that they ought to eat much more than they really need.

This is particularly so with sedentary workers at or past middle age. As that indefinite though real period known as "the prime of life" is passed, creature comforts come to appeal more and more; the spartan recklessness of youth dies away and pleasurable indulgence appears to be more man's desire. Of those comforts, eating is one of the foremost. Coupled with this development is often a growing disinclination for active exercise. True, golf, bowls and other pastimes are designed to supply this exercise, but they are poor substitutes for the spontaneous activity of youth. Thus it is that those who have never been worried by the lack of appetite become a prey to the insidious fault of over-eating in middle age. For such as these, moderation is more than a motto, it is a necessity.

In advocating moderation or a restriction of food for middle-aged people of sedentary habit, there is no desire to condone neglect of eating or to close one's eyes to the undesirability of a poor appetite, any more than in earlier life. The moderation which is practised should be an all-round restraint and not the faddist's exclusion of a particular food. Modern science knows no reason why "red" meats should be prohibited while "white" meats should be permitted. Modern science knows no reason why proteins and carbohydrates should be regarded as incompatible, and excluded from the privilege of combining in a meal. Modern science *does* realize, however, that most people, and especially those of the earlier generations, eat far too little of such foods as fruit, milk, and vegetables. For that reason it is suggested that the restriction of the "over 40" diet should commence with the other articles of diet, especially those containing a preponderance of the highly-refined foods.

Effects of Over-eating.

Over-indulgence in almost any form (including over-indulgence in work) is one of the predisposing causes of high blood pressure. Over-eating is an important factor in the causation of diabetes, gout and other kindred disorders. Even if these definite diseases are not developed (because other things than over-eating must be acting), a state of impaired health and decreased efficiency must result. The tendency to drop off to sleep after lunch is sometimes due to this. A certain laxity of mind is normal after a meal, but drowsiness is abnormal. Increasing girth in middle age is partly due to over-eating, although other factors enter in here, such as the balance of the ductless glands and loss of muscular tone. Digestive disorders are certainly encouraged by eating too much, especially too much of the highly refined foods.

Slimming.

To reduce weight is a modern fad. For people who become over-weight by reason of obvious over-eating, a reduction of food and a consequent reduction of weight is reasonable enough. Apart from this, however, especially in younger people, slimming is a bad and often dangerous practice. People are not all cast in the same mould—thank goodness! There are people who, for one reason or another, remain slim and are perfectly healthy. For those people to fatten up, a change in

their make-up or definite over-eating would be necessary. Similarly, there are naturally stout people, and for these to "slim" necessitates a process of starvation. Many are the disasters to be attributed to this bad practice, not the least of which is predisposition to tuberculosis. There is one rule which these people who wish to reduce might bear in mind—the minimum amount of weight for a given diet is gained if the diet is perfectly balanced. A maintenance diet, perfectly balanced, is the minimum amount of food that can be taken with safety.

Dietary Rules.

1. If your appetite is normal, treasure it and do not abuse it by neglect or by gorging. Avoid conditions which might interfere with your digestion.

2. If your appetite is poor, examine your eating habits carefully and put them right. If the appetite is still poor, consult a medical man.

3. If you are at all worried about your appetite, consult your doctor.

4. If you are past middle age, and engaged in sedentary work, ask yourself frankly if you are eating too much. If so, reduce the quantity a little and see if you feel any better for it.

5. Do not be misled by single idea enthusiasts. There is no royal road to health, there is only a guiding principle—moderation!

6. It is safer to be over-weight under thirty-five and under-weight over thirty-five.

Plate 93.

Jacqueline.—A little Queenslander of the cattle country of the South-West.

IN THE FARM KITCHEN.

CURRIES FOR COLD DAYS.

A Simple Curry.

Take ½ small apple, ¼ onion, 1 oz. margarine, 1 teaspoonful curry-powder, 1 teaspoonful curry-paste, 1 dessertspoonful flour, ¾ pint stock, 1 tablespoonful coconut, ¾ lb. cooked meat, 3 oz. boiled rice, chutney.

Place the coconut in the stock and allow it to soak. Chop the apple and onion finely, and fry in the margarine till slightly browned. Add the curry paste and powder. Strain off the coconut and add the stock, then simmer gently from thirty to forty-five minutes, then add the meat cut into dice. Blend the flour to a smooth paste and add it to the mixture. Stir till boiling, place the lid on the saucepan, and keep under boiling point from ten to fifteen minutes. Dish inside a border of boiled rice. Serve with chutney.

Curried Mushrooms.

Take ½ lb. small mushrooms, 1 hard-boiled egg, 1 dessertspoonful curry-powder, ½ oz. flour, 1 oz. butter, juice ½ lemon, 1 gill milk, ½ onion, salt, 3 oz. rice.

Peel and wash the mushrooms, and remove the stalks. Chop the onion and egg. Fry the onion and mushrooms gently in the butter for five minutes. Put the mushrooms on a plate. Mix the curry-powder and flour with the butter and fried onion and add the milk gradually. Stir it till it boils, and add the egg, salt, and lemon juice. Place the mushrooms in a double saucepan and pour the sauce on to them, leaving them for thirty minutes or till tender. Wash the rice and boil it for fifteen minutes in fast-boiling water. To serve, heap the rice in the middle of a hot dish with the mushrooms round it.

Farmhouse Curry.

Take 1 dessertspoonful curry-powder, ½ pint stock or water, ½ lb. cold meat, 1 dessertspoonful flour, 1 tablespoonful apple chutney, 2 tablespoonfuls cream, salt, 1 onion, 1 apple, milk, 1 oz. dripping, lemon juice, boiled rice.

Chop the meat, removing all gristle. Melt dripping, and when smoking hot fry onion, flour, and curry-powder together for a few moments, stirring all the time. Add chopped apple, salt, and stock or water. Stir carefully till sauce is smooth and boiling, then simmer for half an hour. Add meat, thin with milk, add chutney, and bring again to the boil. Just before serving, stir in a few drops of lemon juice, then cream, and serve surrounded with boiled rice.

Curried Lamb Casserole.

Take 1¼ lb. neck of lamb, 1 teaspoonful curry-powder, 1 teaspoonful flour, ½ lb. carrots, seasoning, 4 small onions, ½ lb. potatoes (new if possible), cold water.

Scrape or peel potatoes, scrape carrots, and boil in salted water till tender. Peel the onions and boil till tender separately. Drain the vegetables, cut potatoes and onions in half, and slice the carrots. Simmer the meat till tender in boiling water. Remove from the pan and cut into pieces. Mix the curry-powder and flour to a paste with a little cold water and add about three-quarters of a pint of the liquor the meat was boiled in. Mix till smooth and add seasoning. Put the meat and vegetables in a casserole. Pour the curried stock over. Cover and bake in a fairly hot oven for half an hour.

Curried Bananas.

Take 3 oz. rice, 4 bananas, ½ oz. margarine, ½ oz. flour, ½ apple, ½ onion, 1 teaspoonful curry-powder, 1½ gills water, juice ½ lemon, 2 hard-boiled eggs, 1 teaspoonful salt.

Wash the rice and boil it for fifteen minutes with the salt in plenty of fast-boiling water. Boil the eggs for ten minutes, put them in cold water, and remove the shells.

To make the curry sauce, peel and chop the apple and onion, and fry them in the margarine for five minutes. Stir in the flour, curry-powder, lemon juice, and a pinch of salt, and add the water gradually. Stir the sauce till it boils, lay the skinned bananas in the sauce and heat them for about five minutes. Add a little more water if necessary. Strain the rice into a colander and grate the onion on to it. Do not mash the rice. If it is boiled for exactly the right time each grain will be separate. Heap the rice on a hot dish with the bananas and sauce round, and garnish with quarters of hard-boiled egg.

Bengal Curry.

Take 1 oz. butter or margarine, 1 small onion, 1 dessertspoonful curry-powder, ¼ to ½ pint milk, ½ lb. rice, ½ lb. uncooked or any left-over meat will do.

Cut the onion into slices and put into a saucepan with the butter. Fry until browned, then add the curry-powder and mix well. Pour in the milk and mix thoroughly with the curry. Cut the meat into pieces about an inch square, add to the saucepan, and allow to simmer for about twenty minutes. Turn into a flat dish and serve with a border of boiled rice, piping hot.

Note: Be sure to fry the curry-powder well in butter or margarine before the liquid is added, which turns it into a sauce. Then simmer until all the ingredients are well mixed.

Curried Vegetable Patties.

Take 1 cupful of any cold vegetables, 1 oz. sultanas, 1 onion, ½ oz. flour, 1 gill water, ½ gill vinegar, ½ oz. curry-powder, ¼ teaspoonful salt, parsley, 3 or 4 slices stale bread about two inches thick, ¾ oz. butter, deep frying fat.

Mince the onion and fry it in the butter for five minutes. Stir in the flour, curry-powder, and vinegar. Add the water and sultanas and stir till boiling. Season to taste. Chop the cold vegetables and add them to the sauce. Keep them hot on a very low gas while making the fried bread-cases.

To make the cases, cut the bread into rounds and scoop out the centre. Fry one at a time in smoking hot fat for about three minutes, turning them over when one side is done. They should be a golden brown. Drain them on paper and fill with the hot vegetable mixture. Serve on a lace paper and garnish with parsley.

Madras Curry.

Take 1 good-sized onion, 4 oz. desiccated coconut, ½ oz. butter, 1 dessertspoonful curry-powder, ½ apple, a strip of lemon-peel, 2 or 3 cloves, 6 oz. rice, ½ lb. lean uncooked meat.

Pour a large teacupful of boiling water over the grated coconut, allow to stand for a little while, then strain off the milk and set by. Cut the onion into slices and fry in the butter until browned. Fry the curry-powder, and add half the coconut milk, mixing all well together. Add half of an apple, peeled and cut into slices, a strip of lemon-peel (this should be taken out when served), and two or three cloves. Cut the meat into small pieces, stir into the mixture, and allow to simmer for about two hours. Before serving add the remainder of coconut milk. Turn on to a flat dish and serve with a border of boiled rice.

THE DIPPING OF CATTLE.

The dipping of cattle is sometimes treated casually in tick-infested areas and this is not infrequently the cause of an unsatisfactory clean up, and also of ill effects on the stock such as scalding.

Cattle should be quietly driven to the dip and allowed to cool down in the yard before they are passed through the dipping fluid. "Rushing" is both unnecessary and undesirable. Cattle often tend to race back to the farm after treatment, but they should always be steadied down to a moderate pace.

Dairy cows are particularly susceptible to scald in the udder, and injuries of this type frequently lead to difficulties in milking. Scalding is often attributed to too strong a dipping fluid; but the real trouble is more often the failure of the farmer to grease the sensitive parts of the udder before the cows leave the farm for the dip.

All the ticks may not be killed at one treatment, even when the dipping fluid is of standard strength. Ticks in the process of moulting may survive while travelling stock sometimes accumulate sufficient dirt and grime in the heavy winter coat to protect some of the more sheltered pests. Nevertheless, where reinfestation is not heavy, properly tended cattle should not be troubled by ticks for some time after dipping and the farmer cannot afford to neglect the only known method of coping with the pest.

J. Gunn, Stock Branch.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF JUNE, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1937 AND 1936, FOR COMPARISON.

Divisions and stations.	Average Rainfall.		Total Rainfall.		Divisions and stations.	Average Rainfall.		Total Rainfall.	
	June.	No. of years' records.	June, 1937.	June, 1936.		June.	No. of years' records.	June, 1937.	June, 1936.
North Coast.	In.		In.	In.	*Central Highlands.*	In.		In.	In.
Atherton	1·69	36	0·25	3·96	Clermont ..	1·68	66	1·70	2·51
Cairns	2·90	55	0·30	8·12	Gindie	1·45	38	..	1·63
Cardwell	2·04	65	0·83	2·82	Springsure ..	1·77	68	0·92	1·91
Cooktown ..	2·02	61	0·03	4·29					
Herberton ..	1·17	51	0·07	2·68					
Ingham	2·41	45	1·51	4·50					
Innisfail	7·28	56	3·19	13·64	*Darling Downs.*				
Mossman Mill ..	2·53	24	0·70	9·56					
Townsville ..	1·38	66	0·75	4·90	Dalby	1·67	67	1·04	1·56
Central Coast.					Emu Vale ..	1·50	41	0·78	1·27
					Hermitage ..	1·75	31	..	1·82
Ayr	1·50	50	0·48	5·37	Jimbour ..	1·65	49	0·79	0·79
Bowen	1·65	66	1·54	5·66	Miles	1·77	52	0·68	1·29
Charters Towers ..	1·32	55	1·90	5·23	Stanthorpe ..	1·90	61	1·33	1·27
Mackay	2·74	66	1·88	10·31	Toowoomba ..	2·38	65	1·19	1·64
Prosperine ..	3·41	34	1·56	11·44	Warwick ..	1·74	72	0·68	1·68
St. Lawrence ..	2·51	66	1·40	6·39					
South Coast.									
					Maranoa.				
Biggenden ..	2·25	38	0·92	5·48					
Bundaberg ..	2·88	54	1·26	5·23	Roma	1·57	63	0·50	1·29
Brisbane	2·71	85	0·73	1·90					
Caboolture ..	2·68	50	1·14	2·17					
Childers	2·49	42	0·79	3·90					
Crohamhurst ..	4·48	44	1·74	4·57					
Esk	2·22	50	1·16	2·02					
Gayndah	1·83	66	0·72	3·07					
Gympie	2·68	67	1·21	3·65	*State Farms, &c.*				
Kilkivan	2·12	58	1·16	3·47					
Maryborough ..	3·02	66	1·63	4·61	Bungeworgorai ..	1·30	22	..	1·26
Nambour	3·75	41	1·94	4·86	Gatton College ..	1·82	38	0·82	1·96
Nanango	1·98	55	1·29	2·13	Kairi	1·46	21	..	..
Rockhampton ..	2·59	66	1·60	4·67	Mackay Sugar Experiment Station	2·50	40	1·57	9·90
Woodford	2·89	50	1·51	2·57					

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—JUNE, 1937.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Mean Atmospheric Pressure, at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.				Total.	Wet Days.
		Max.	Min.	Max.	Date.	Min.	Date.		
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·95	78	66	85	4	54	25	3	1
Herberton		73	49	80	14, 15	32	21, 23	7	4
Rockhampton	30·06	72	52	83	13	41	3	160	5
Brisbane	30·07	67	51	71	13	43	30	73	8
Darling Downs.									
Dalby	30·10	64	40	72	9, 10	27	2	104	9
Stanthorpe	..	57	34	65	10	18	3	133	13
Toowoomba	..	60	41	66	13	24	17	119	6
Mid-Interior.									
Georgetown	30·00	81	51	90	13	34	21	Nil	..
Longreach	30·10	71	43	80	9	34	2	79	5
Mitchell	30·13	65	36	74	10	23	2	110	4
Western									
Burketown	30·02	80	55	89	14	44	22	Nil	..
Boulia	30·12	70	46	77	13	40	2, 3, 6, 7, 27, 28	89	2
Thargomindah	30·12	64	41	75	9	29	2	51	3

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	August. 1937.		September. 1937.		Aug. 1937. MOONRISE.	Sept. 1937. MOONRISE.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	6.35	5.21	6.7	5.37	1.4	2.56
2	6.34	5.22	6.6	5.37	2.8	3.45
3	6.33	5.23	6.5	5.38	3.11	4.27
4	6.33	5.24	6.4	5.38	4.9	5.6
5	6.32	5.25	6.3	5.39	5.2	5.43
6	6.31	5.25	6.2	5.39	5.51	6.19
7	6.31	5.26	6.1	5.40	6.33	6.54
8	6.30	5.26	5.58	5.40	7.11	7.29
9	6.29	5.27	5.57	5.41	7.47	8.6
10	6.28	5.27	5.56	5.41	8.22	8.46
11	6.28	5.28	5.55	5.42	8.56	9.26
12	6.27	5.28	5.53	5.42	9.32	10.10
13	6.26	5.29	5.52	5.43	10.9	10.59
14	6.25	5.29	5.51	5.43	10.50	11.51
						p.m.
15	6.24	5.30	5.50	5.44	11.31	12.46
					p.m.	
16	6.23	5.30	5.49	5.44	12.17	1.40
17	6.22	5.31	5.48	5.45	1.7	2.37
18	6.21	5.31	5.47	5.45	2.0	3.36
19	6.20	5.32	5.45	5.45	2.56	4.35
20	6.19	5.32	5.44	5.46	3.52	5.34
21	6.18	5.33	5.43	5.46	4.49	6.36
22	6.18	5.33	5.42	5.47	5.49	7.36
23	6.17	5.33	5.41	5.47	6.48	8.48
24	6.16	5.34	5.40	5.47	7.48	9.54
25	6.15	5.34	5.39	5.48	8.48	10.56
26	6.14	5.35	5.38	5.48	9.52	11.58
27	6.13	5.35	5.37	5.49	10.56	—
						a.m.
28	6.12	5.36	5.36	5.49	..	12.52
					p.m.	
29	6.11	5.36	5.35	5.50	12.2	1.40
30	6.10	5.37	5.34	5.50	1.4	2.24
31	6.9	5.37			2.3	

Phases of the Moon, Occultations, &c.

6 Aug.	●	New Moon	10 37 a.m.
14 ,,	☾	First Quarter	12 28 a.m.
22 ,,	○	Full Moon	10 47 a.m
29 ,,	☽	Last Quarter	9 55 a.m.

Perigee, 3rd August, at 2 p.m.
Apogee, 15th August, at 1 p.m.
Perigee, 29th August, at 1 p.m.

On the morning of the 4th Venus, the beautiful Morning star, will be seen near the waning Moon.

Mars, whose movements have been watched with interest for some months will on the 15th again be in the head of the Scorpion as at the beginning of April. On its journey eastward through the narrow part of Orphincus it will pass the brightest stars in Scorpion.

Jupiter, the most brilliant object in the evening sky, appears high in the east after sunset. Apparently moving westward it will on the 28th be near the brightest stars in Sagittarius. It is now more than two million miles nearer the Earth than it was in the middle of July when, at its nearest, a distance of nearly 600 million miles separated us from the giant planet.

Saturn, rising about 9.30 p.m. at the beginning of the month and about two hours earlier at the end, will be found almost in line with the two stars forming the eastern side of the Great Square of Pegasus.

Mercury rises at 7.49 a.m., 1 hr. 14 min. after the Sun and sets at 7.1 p.m., 1 hr. 40 min. after it on the 1st; on the 15th it rises at 7.41 a.m., 1 hr. 40 min. after the Sun and sets at 7.35 p.m., 2 hr. 5 min. after it.

Venus rises at 3.40 a.m., 2hr. 55 min. before the Sun and sets at 2.14 p.m., 3 hr. 7 min. before it on the 1st; on the 15th it rises at 3.52 a.m., 2 hr. 32 min. before the Sun and sets at 2.28 p.m., 3 hr. 2 min. before it.

Mars rises at 12.1 p.m. and sets at 1.39 a.m. on the 1st; on the 15th it rises at 11.28 p.m. and sets at 1.16 a.m.

Jupiter rises at 3.53 p.m. and sets at 5.33 a.m. on the 1st; on the 15th it rises at 2.50 p.m. and sets at 4.36 a.m.

Saturn rises at 9.33 p.m. and sets at 9.41 a.m. on the 1st; on the 15th it rises at 8.35 p.m. and sets at 8.14 a.m.

The Southern Cross will be on its downward path towards the west, accompanied by two of the finest constellations, the Centaur and Argo, the Ship; but in the north-east the Northern Cross has arisen, part of the constellation Cygnus, the Swan, which with outstretched wings is flying upwards.

5th Sept.	●	New Moon	8 54 a.m.
13th ,,	☽	First Quarter	6 57 a.m.
20th ,,	○	Full Moon	9 32 p.m.
27th ,,	☾	Last Quarter	3 43 p.m.

Apogee, 12th September, at 8 a.m.
Perigee, 24th September, at 7 a.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate; as the relative positions of the sun and moon vary considerably.

[All the particulars on this page were computed for this Journal, and should not be reproduced without acknowledgment.]